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Holcroft of the University of California (Davis, CA). He recommends testing blood substitutes in patients with severe injuries involving the central nervous system, because mortality rates are highest in these patients. "We probably should use survival or neurologic outcome as the end point, and compare blood substitutes to no red blood cells or universal-donor red blood cells," says Holcroft.

FDA officials appear to accept this rationale for blood-substitute clinical testing. However, they still hedge over what they will use as efficacy criteria for these substitutes. Indeed, several workshop participants point out that no one knows just how to judge the effectiveness

of blood itself, let alone blood substitutes. In practice, decisions to administer blood transfusions are left to the judgment of individual physicians. It is widely believed that administering blood saves lives, but that belief has not been put to a systematic test.

At least some experts argue that the time-honored faith in blood is not above reconsideration, particularly because the use of blood is not free of serious risks. "Blood substitutes should not be held to higher standards than blood itself," asserts Robert Winslow of the University of California (San Diego, CA). In fact, the use of blood substitutes to decrease the use of donated blood "is a valid goal" in

itself, Winslow argues.

Other applications of blood substitutes may also offer opportunities for efficacy testing. Such substitutes could be considered for testing in cancer patients, according to Beverly Teicher of the Sidney Farber Cancer Institute (Boston, MA). The low oxygen levels that prevail in many tumors lowers the efficacy of many antitumor treatments. Yet when oxygen levels are raised in cancer cells *in vitro* or in animals, both chemical agents and radiotherapeutic procedures become more effective. "It is now time for clinical trials of these agents," says Teicher, referring to the testing of blood substitutes as adjuncts to cancer therapy. —Jeffrey L. Fox

Biotech fades in 1993 venture-backed IPO market

NEW YORK—Last year was another record year for U.S. venture-capital-backed initial public offerings (IPOs), as 165 venture-backed companies tapped the public market for \$4.9 billion (Table 1), reports Securities Data Publishing (New York). This topped the previous record performance of 1992, when 157 venture-backed IPOs netted \$4.6 billion. Indeed, the overall IPO market soared last year because investors—frustrated by low interest rates in the fixed-income markets—turned to stock mutual funds, whose appetite for IPOs was ravenous.

Biotechnology played a diminishing role in last year's venture-backed IPO market, with just 14 venture-backed biotech companies going public, accounting for just 8.5 percent of the year's venture-backed

IPOs. This is a fall from 1992, when 24 venture-backed biotech companies went public, making up 16 percent of the year's venture-backed IPOs. A drop in biotech stock prices contributed to last year's fall in venture-backed IPOs, as high-profile-product failures and uncertainty over the Clinton administration's promised health-care reform wreaked havoc on the sector. Lower stock prices for already-public biotech companies forced down the valuations of private biotech companies, making it difficult for these private companies to rationalize going public.

Last year's 14 biotech IPOs raised an average of \$21.0 million each, 29 percent less than the \$29.6 million raised by all of last year's venture-backed IPOs, on average. The biotech IPOs had an average price of \$9.04 a share, 19 percent less

than the \$11.16 a share offering price averaged by all of 1993's venture-backed IPOs. And in the aftermarket, the biotech IPOs saw their stock price rise an average of 23 percent by the end of the year, while all of last year's venture-backed IPOs saw their stock price rise an average of 33.8 percent by the year's end. In all, three biotech firms were among the 10 worst-performing venture-backed IPOs in 1993, including BioSurface Technology (Cambridge, MA) with a 68.8 percent stock-price drop, CoCensys (Irvine, CA) with a 55.6 percent fall, and Telor Ophthalmic Pharmaceuticals (Woburn, MA) with a 46.9 percent tumble. Vical, for its part, was among last year's 10 best-performing venture-backed IPOs, with a 170 percent stock-price jump. —B.J. Spalding

TABLE 1. 1993 venture-backed IPOs.

Sector	Companies	Average Money Raised (\$ Millions)	Average IPO Stock Price	Average Stock Price 12/31/93	Average Stock Price Change
Other electronics-related	26	\$22.47	\$10.46	\$14.31	37%
Medical/health-related	25	21.31	8.64	9.27	7
Computer software & services	25	31.32	12.82	16.20	19
Consumer-related	20	36.94	13.28	17.59	23
Telephone & data communications	20	38.89	12.81	17.48	27
Biotechnology	14	21.01	9.04	10.56	23
Other	13	35.08	11.30	14.98	27
Computer hardware	10	27.21	11.20	13.56	16
Industrial machines & equipment	6	26.06	10.71	11.19	2
Energy-related	4	61.46	14.25	15.72	24
Commercial communications	1	26.25	10.50	30.88	194
Industrial automation	1	16.20	9.00	9.50	6
Total	165	29.60	11.16	15.10	33.75

Source: Securities Data Publishing (New York).