Table 1. Curability of cancer by chemotherapy (1982–1983).

Type of cancer	Incidence	(−)*	Potential curability				Reference
			Established		Putative		
			Percent	Number	Percent	Number	
ALL† (pediatric)	2,000	(2,000)	50	1,000	80	1,600	*6*
ALL (adult)	3,600	(3,600)	20	720	40	1,440	*7*
AML‡ (pediatric)	350	(350)	20	70	40	140	*8*
AML (adult)	6,000	(4,500)	10	450	20	900	*8*
Breast (premenopausal)	41,500	(20,750)	10	2,075	15	3,113	*2, 5*
Breast (postmenopausal)	72,500	(26,100)	10	2,600	15	3,915	*2, 5*
Gastric (stage I)	24,500	(8,085)	0	0	15	1,213	*9*
Hodgkin's (stages III and IV)	7,100	(4,260)	40	1,704	80	3,408	*10*
Lung, small cell							
Limited	18,005	(15,188)	10	1,519	20	3,038	*11*
Advanced	18,005	(15,188)	3	450	5	759	*11*
Lymphoma, non-Hodgkin's	23,000	(9,315)	40	3,726	65	6,521	*12*
Pediatric solid tumors§	2,250	(2,135)	25–75	1,074	60–96	1,638	*13*
Testis	5,400	(3,240)	60	1,944	90	2,916	*14*
Trophoblastic disease	1,000	(1,000)	> 80	948	> 80	948	*15*
Total				18,280		31,549	

*Subset appropriate for curative intent chemotherapy (see text) (*3*). †Acute lymphocytic leukemia. ‡Acute myelogenous leukemia. §Includes Wilms', rhabdomyosarcoma, Ewing's, lymphoma, and osteosarcoma.

or elderly patients who might not be appropriate for combination chemotherapy. Curability was expressed as "established" (long accepted cure rates) and "putative" (more recent, but confirmed, studies). The potential absolute cure figures were calculated as the product of the incidence and cure rate. The assumption that clinical trials conducted in centers can be successfully transferred to the community is supported by recent studies (*4*).

I will discuss breast cancer, the most controversial example, and list the remainder in Table 1. An estimated 114,000 women will develop breast cancer in 1983. Of these 41,500 will be premenopausal. Fifty percent of all patients will have invasion of axillary nodes. Adjuvant combination chemotherapy in such patients increases survival in premenopausal and, in most studies, in postmenopausal patients. Breast cancer is an indolent disease, and the risk of relapse continues beyond 10 years. Hence, cure rates cannot be established in the absence of long-term follow-up. In a randomized study adjuvant chemotherapy provided a 15 percent improvement in survival, which was sustained through 15 years of follow-up in both premenopausal and postmenopausal patients. Similar results with shorter follow-up have been achieved by a number of additional studies (*2, 5*). The cure rates and potential numbers for breast cancer and the other 12 diseases are presented in Table 1 (*2, 5–16*). The totals (established, 18,280; putative, 31,549) represent underestimates, in that they are based necessarily on the results of relatively mature studies.

More recently, major advances in terms of the frequency, magnitude, and duration of tumor regression have been achieved in the chemotherapy of head and neck cancer (80 percent response rate), ovarian cancer, esophageal cancer, lung cancer, gastric cancer, bladder cancer, endometrial and cervical cancer, and soft tissue sarcoma (*16*). The incidence and death rate from these tumors is 375,200 and 187,500, respectively. Some multimodality studies (chemotherapy combined with surgery or radiotherapy, or both) produce results compatible with potential cures of more than 10,000 patients. Because the studies are of insufficient duration, secure quantitative data is not available.

Tumors of immunologic and embryologic cell origin are more curable, perhaps for the reasons cited by Cairns and Boyle. However, the implication that epithelial tumors will not respond is not true. Major effectiveness for chemotherapy has been demonstrated against epithelial tumors in culture and transplanted in mice. Many of the tumors included in the table and text are epithelial in origin and chemoresponsive.

The final comment of Cairns and Boyle that the cancer treatment results are hyped for political-fiscal purposes is incorrect and unfortunate. Before 1973, only a few institutions and scientists focused on cancer treatment. Largely as a result of public support, many universities and centers have made significant commitments to cancer treatment. Such a dynamic and important discipline must be evaluated on the basis of current information, albeit tentative, and not on the basis of data from a decade or more ago.

EMIL FREI III
Dana-Farber Cancer Institute,
44 Binney Street,
Boston, Massachusetts 02115

References

1. *SEER—Incidence and Mortality Data: 1973–77* (National Cancer Institute Monograph No. 57, Department of Health and Human Services, Washington, D.C., 1981).
2. J. F. Holland, *J. Clin. Oncol.* **1**, 75 (1983).
3. E. Silverberg and J. A. Lubera, *Cancer J. Clin.* **33**, 2 (1983).
4. C. B. Begg, P. P. Carbone, P. J. Elson, M. Zelen, *N. Engl. J. Med.* **306**, 1076 (1982).
5. R. Nissen-Meyer, in *Clinical Trials in Early Breast Cancer*, M. Baum, R. Kay, H. Scheurlen, Eds. (Birkhauser, Basel, 1982), pp. 571–579; G. Tancini, G. Bonadonna, P. Valagussa, S. Marchini, U. Veronesi, *J. Clin. Oncol.* **1**, 2 (1983); G. Bonadonna, *N. Engl. J. Med.* **304**, 10 (1981); S. Rivkin, H. Goucksberg, M. Foulkes, *Proc. Am. Soc. Clin. Oncol.* **1**, 74 (1982).
6. G. Henze, H.-J. Langermann, J. Ritter, G. Schellong, H. N. Ruhm, in *Modern Trends in Human Leukemia*, R. Neth *et al.*, Eds. (Springer-Verlag, Berlin, 1981), vol. 4, pp. 87–93; S. E. Sallan, E. Frei III, H. Weinstein, R. Mayer, D. Rosenthal, D. G. Nathan, paper presented at the 19th Congress of the International Society of Hematology and the 17th Congress of the International Society of Blood Transfusion, Budapest, Hungary, August 1982.
7. R. J. Mayer, F. S. Coral, D. S. Rosenthal, S. E. Sallan, E. Frei III, *Proc. Am. Soc. Clin. Oncol.* **1**, 126 (1982); D. Clarkson, Z. Arlin, T. Gee, R. Mertelsmann, S. Kempin, C. Higgins, C. Little, *J. Clin. Oncol.*, in press.
8. H. J. Weinstein, R. J. Mayer, D. S. Rosenthal, B. M. Camitta, F. S. Coral, D. G. Nathan, E. Frei III, *N. Engl. J. Med.* **303**, 473 (1980); H. D. Preisler, in *Leukemia*, F. W. Gunz and E. S. Henderson, Eds. (Grune & Stratton, New York, 1983), p. 627.
9. Gastrointestinal Tumor Study Group, *Cancer* **49**, 1116 (1982).
10. A. Santoro, G. Bonadonna, V. Bonfante, P. Valagussa, *N. Engl. J. Med.* **306**, 77 (1982); D. J. Straus, J. Myers, B. Koziner, B. J. Lee, L. Nisce, B. J. Clarkson, *Proc. Am. Soc. Clin. Oncol.* **1**, 160 (1982).
11. R. L. Comis, *Cancer Treat. Rev.* **9**, 237 (1982).
12. A. T. Skarin *et al.*, *J. Clin. Oncol.* **1**, 91 (1983); R. I. Fisher *et al.*, *Proc. Am. Soc. Clin. Oncol.* **1**, 161 (1982); D. L. Sweet *et al.*, *Ann. Intern. Med.* **92**, 785 (1980); J. Lawrence, M. Coleman, S. L. Allen, R. T. Silver, N. Pasmantier, *ibid.* **97**, 190 (1982).
13. G. Rosen *et al.*, in *Sarcomas of Soft Tissue and Bone in Childhood* (National Cancer Institute Monograph No. 56, Department of Health and Human Services, Washington, D.C., 1981), pp. 213–220; N. Jaffe *et al.*, in *ibid.*, pp. 201–206; D. R. King and H. W. Clatworthy, Jr., *Semin. Oncol.* **8**, 215 (1981); H. J. Weinstein and M. P. Link, *Clin. Haematol.* **8**, 699 (1979); G. Rosen *et al.*, *Cancer* **47**, 2204 (1981); G. J. D'Angio *et al.*, *ibid.*, p. 2302.
14. L. H. Einhorn and S. D. Williams, in *Testicular Tumors: Management and Treatment*, L. H. Einhorn, Ed. (Masson, New York, 1980), pp. 117–149; M. B. Garnick, G. P. Canellos, J. P. Richie, *J. Am. Med. Assoc.*, in press.
15. *Semin. Oncol.* **9** (June 1982).
16. T. J. Ervin *et al.*, *Cancer Treat. Rep.* **65**, 787 (1981).

Erratum: In the article "The new inflationary universe" by M. Mitchell Waldrop (Research News, 28 Jan., p. 375), it was stated incorrectly that, in the standard model, the expanding universe cooled below 10^{27} degrees Kelvin about 10^{35} seconds after the Big Bang. The correct time is 10^{-35} second.