

respective virion RNAs, and the 20–22S of the two recombinants also contained a unique internal oligonucleotide (no. 15) that maps close to the 5' end of each recombinant RNA, the 5' segment of each 20–22S RNA species must have been transcribed from a proviral DNA segment corresponding to the 5' end of virion RNA.

A minimum estimate for the length of the 5' segment is 16 nucleotides (oligonucleotide no. 15, ref. 2) plus 22 nucleotides (large cap-oligonucleotide) or 37 nucleotides. This segment, however, is likely to be longer because recombination occurs between oligonucleotide no. 15 and the 5' end (as in recombinant no. 5) and because oligonucleotide no. 15 also occurs at the 5' end of RSV-B77<sup>12</sup> though it is not found in the first 110 nucleotides as sequenced by Shine *et al.*<sup>19</sup>.

It may be argued that the viral 5' oligonucleotides in the 20–22S cellular species were derived from minor contaminants of intact or degraded virion RNA selected by our cDNA rather than from a subgenomic 20–22S RNA. Although, our cDNA contained typically (ref. 23) three- to five-fold more sequences complementary to the 5' oligonucleotides than to other oligonucleotides (determined by hybridisation to an excess of <sup>32</sup>P-viral RNA and fingerprinting of RNase T<sub>1</sub>-resistant hybrids), this possibility has been ruled out for the following reasons (data not shown). The fingerprints of 35–40S viral RNA isolated from infected cells had an equimolar representation of all oligonucleotides indicating no bias in the selection process. In addition, if our PR-B poly(dC)cDNA was hybridised to a 10-fold excess of 30–40S <sup>32</sup>P-viral RNA and the hybrids were selected and fingerprinted as in Fig. 2 all PR-B oligonucleotides were approximately equimolar. This is because asymmetrical hybrids consisting of small, approximately 5S cDNA and large viral RNAs sedimenting between 10 and 35S, with a peak at 18S, were selected for fingerprint analysis by our method. Since the cellular viral RNA species analysed in this paper were also large after isolation (average approximately 18S), oligonucleotides adjacent to the 5' terminus should have also been detected if the 5'-terminal oligonucleotides were derived from contaminating intact or degraded viral RNA species.

We conclude that RSV-infected cells contain specific viral RNA species which consist of a capped segment from the 5' end of virion RNA attached to a polyadenylated longer segment from the 3' end. This suggests that subgenomic RSV RNAs are synthesised by a splicing mechanism analogous to that observed in adenovirus or perhaps by transcription from specifically deleted proviral DNAs. The data argue against subgenomic RNAs being generated by cleavage of 35–40S RNA or by internal transcription of full-length provirus. Further work is necessary to establish whether these subgenomic viral RNAs function as mRNAs.

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- Baltimore, D. *Cold Spring Harbor Symp. quant. Biol.* 39, 1187–1200 (1975).
- Wang, L. H., Duesberg, P., Mellon, P. & Vogt, P. K. *Proc. natn. Acad. Sci. U.S.A.* 73, 1073–1077 (1976).
- Wang, L. H., Galehouse, D., Mellon, P., Duesberg, P., Mason, W. S. & Vogt, P. K. *Proc. natn. Acad. Sci. U.S.A.* 73, 3952–3956 (1976).
- von der Helm, K. & Duesberg, P. H. *Proc. natn. Acad. Sci. U.S.A.* 72, 614–618 (1975).
- Kerr, I. M., Olshevsky, U., Lodish, H. G. & Baltimore, D. *J. Virol.* 18, 627–635 (1976).
- Stacey, D. W., Allfrey, V. G. & Hanafusa, H. *Proc. natn. Acad. Sci. U.S.A.* 74, 1614–1618 (1977).
- Pawson, T., Harvey, R. & Smith, A. E. *Nature* 268, 416–420 (1977).

- Hayward, W. S. *J. Virol.* 24, 47–63 (1977).
- Bishop, J. M., Deng, C.-T., Mahy, B. W. J., Quintrell, N., Stavnezer, E. & Varmus, H. in *Animal Virology* (eds Baltimore, D., Huang, A. S. & Fox, C. F.) 4, 1–20 (Academic Press, New York, 1976).
- Chow, L. T., Gelinis, R. E., Broker, T. R. & Roberts, R. J. *Cell* 12, 1–8 (1977).
- Berget, S. M., Moore, C. & Sharp, P. A. *Proc. natn. Acad. Sci. U.S.A.* 74, 3171–3175 (1977).
- Wang, L. H., Duesberg, P., Beemon, K. & Vogt, P. K. *J. Virol.* 16, 1051–1070 (1975).
- Wang, L. H. & Duesberg, P. *J. Virol.* 14, 1515–1529 (1974).
- Beemon, K. L. & Keith, J. M. in *Animal Virology* (eds Baltimore, D., Huang, A. S. & Fox, C. F.) 4, 97–105 (Academic, New York, 1976).
- Wang, L. H., Duesberg, P. H., Robins, T., Yakota, H. & Vogt, P. K. *Virology* 82, 472–492 (1977).
- Friedrich, R., Kung, H.-J., Baker, B., Varmus, H., Goodman, H. & Bishop, J. M. *Virology* 79, 198–215 (1977).
- Coffin, J. & Haseltine, W. *Proc. natn. Acad. Sci. U.S.A.* 74, 1908–1912 (1977).
- Collett, M. S. & Faras, A. J. *Proc. natn. Acad. Sci. U.S.A.* 73, 925–932 (1976).
- Shine, J., Czernilofsky, P., Friedrich, R., Bishop, J. M. & Goodman, H. M. *Proc. natn. Acad. Sci. U.S.A.* 74, 1473–1477 (1977).
- Gilham, P. T. *J. Am. Chem. Soc.* 86, 4982–4985 (1964).
- Coffin, J. M., Parsons, J. T., Rymo, L., Haroz, R. K. & Weissmann, C. *J. molec. Biol.* 86, 373–396 (1974).
- Junghans, R., Duesberg, P. & Knight, C. A. *Proc. natn. Acad. Sci. U.S.A.* 72, 4895–4899 (1975).
- Cashion, L. M., Joho, R. H., Planitz, M. A., Billeter, W. A. & Weissmann, C. *Nature* 262, 186–190 (1977).
- Beemon, K., Duesberg, P. & Vogt, P. K., *Proc. natn. Acad. Sci. U.S.A.* 71, 4254–4258 (1974).

## Errata

In the letter 'Structures of benzo(a)pyrene–nucleic acid formed in human and bovine bronchial explants' by A. M. Jeffrey *et al.*, *Nature* 269, p. 348, lines 25–26 in Fig. 1 legend should read . . . poly (G) were detected by ultraviolet absorbance at 280 nm and *in vivo* samples by their radioactivity. Line 19 in Fig. 2 legend should read . . . *in vivo* product was obtained (upper panel, *b*) which, when reanalysed . . . Line 2 in Fig. 3 legend should read . . . corresponding to the major *in vivo* DNA adduct from human and . . . Line 9 in Fig. 3 should read . . . (shaded area at 350–360 nm, 'L<sub>b</sub>, short axis; 310–355, 'L<sub>a</sub>, long . . .

In the letter by R. G. Strom and D. E. Harris, *Nature* 269 581–582 (1977), the title should read 'HD26676: Radio emission from a normal star'. On p. 581 paragraph 3 line 12, for 'Westerbok' read 'Westerbork'. In paragraph 4 line 5 for 'frequency  $\alpha$ ' read 'frequency  $\alpha$ '.

In the letter 'Long-range attraction between red cells and a hydrocarbon surface' by D. Gingell and I. Todd, *Nature* 268, p. 767, two lines have been omitted. Line 12 in paragraph 2 should read . . . the oil/water interface was measured by the hanging drop. . . Line 28 in paragraph 4 should read . . . of attraction from 140 nm to 450 nm. The only kind. . .

## Corrigenda

In the letter 'Structures of benzo(a)pyrene–nucleic acid formed in human and bovine bronchial explants' by A. M. Jeffrey *et al.*, *Nature* 269, p. 348, in Fig. 2 legend line 18 for 50–60% methanol read 50–65% methanol.

In the letter 'Surge activity on the Barnes Ice Cap' by G. Holdsworth, *Nature* 269, p. 588, the journal in ref. 14 should be *J. appl. Met.*

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