

# Rapid falls in maternal serum $\alpha$ -fetoprotein concentrations

MT BREDOW, DJ GOLDIE

*From the Department of Clinical Chemistry, Southmead Hospital, Westbury on Trym, Bristol*

**SUMMARY** The pronounced falls in AFP concentration sometimes seen in samples taken for screening in early pregnancy are consistent with the range of AFP half lives measured in 14 postpartum women of 59-133 h.

Considerable falls in maternal serum  $\alpha$ -fetoprotein (AFP) concentrations sometimes occur when sequential samples are taken for neural tube defect screening in early pregnancy. This often results in high initial values reverting to normal with a rapidity that leads one to doubt that the observations are compatible with the reported half life of AFP in serum of 3.5 days (84 h).<sup>1,2</sup> As the obvious alternative explanation of gross assay error appeared to be excluded by reassay of the paired samples we reinvestigated the half life of AFP in maternal serum and compared our findings with the observed apparent half life of AFP in women showing pronounced falls.

## Patients and methods

The half life of AFP was assessed by noting the fall in AFP in 14 women from the postnatal wards during the first 4-10 days of the puerperium. All patients gave informed consent and were bled daily. Serum was analysed for AFP<sup>3</sup> and albumin (Technicon method no SG4-0030 FD8), and all AFP estimations from individual patients were done in one batch with the serum samples stored frozen until assay. The half life of AFP was determined from the serial measurements using a method described elsewhere.<sup>4</sup> The calculation was complicated by the fact that part of the observed change in serum AFP must have been due to the intravascular fluid volume changes which occur in the first few days after delivery. This phenomenon was reflected by parallel changes in haemoglobin and albumin concentrations (except in one patient who had bled significantly). The AFP concentrations were therefore adjusted in proportion to the changes in albumin before the cal-

culated half lives. The distribution of the calculated half lives was normal and therefore the 95% confidence limits on the half life of AFP were taken as plus or minus two standard deviations (SD) from the mean.

The results of the Avon AFP screening programme from mid-December 1982 to mid-December 1983 were examined to identify all patients who had raised first serum AFP concentrations followed by lower and normal second results. There were 13 such patients. The apparent half life of AFP in these patients was calculated from the two observations using the method described above.

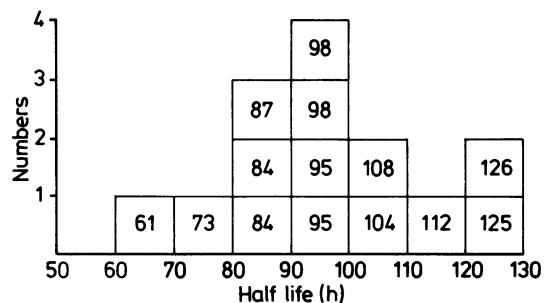
## Results

### HALF LIFE OF AFP IN POSTPARTUM WOMEN

The calculated half lives (to the nearest hour) on the 14 women are shown in the Figure. The mean  $\pm$  2 SD was used to calculate the 95% confidence limits. The mean was 96 h, the SD was 18.3 h, and the 95% confidence limits were therefore 59-133 h.

### HALF LIFE OF AFP IN SCREENED PATIENTS

Of the 13 patients with raised first samples followed by lower and normal second results, eight gave apparent half lives in excess of 133 h. As many of these patients had continuing instability in their pregnancy—that is, persistent pain or bleeding—it was considered that these patients had a continuing transfer of AFP into the maternal circulation and therefore that the crude half life calculations were invalid. The apparent half lives of AFP in the remaining five patients are shown in the Table, which shows that in every case the apparent half life of AFP is consistent with the range derived from the postpartum patients.



Histogram of half life of  $\alpha$ -fetoprotein in postpartum women. Figures within the squares show individual results.

## Discussion

It is recognised that the methods used to estimate half lives are imperfect. The study of women in the puerperium is convenient for measuring the half life of AFP as this is a time when there is an abrupt cessation of input of AFP into the maternal circulation. The position is complicated, however, by the fluid volume changes which take place over the first few days. The use of the albumin correction led to

linear plots of log AFP against time. We therefore considered that this correction was valid.

The calculation of half lives in those pregnant patients who showed pronounced falls in AFP is complicated by the presence of a continuing transfer of AFP by normal physiological mechanisms. As the patients in question had considerably raised first samples, however, we considered that the influence of a possible "background" effect would be negligible.

Overall, the results indicate that even dramatic falls in serum AFP on sequential sampling are consistent with the observed range for AFP half life of 59–133 h.

## References

- Alpert E. Human alpha<sub>1</sub>-fetoprotein. In: Popper H, Schaffner F, eds. *Progress in liver diseases*, vol 5. New York: Grune and Stratton, 1976:337–49.
- Gitlin D. Normal biology of AFP. *Ann NY Acad Sc* 1975;259:7–16.
- Monk Antionette M, Goldie DJ. The significance of raised maternal serum alpha-fetoprotein levels. *Br J Obstet Gynaecol* 1976;83:845–52.
- Belcher EH, Vetter H, eds. *Radioisotopes in medical diagnosis*. London: Butterworths, 1971:4.

### Apparent half lives of $\alpha$ -fetoprotein (AFP) in patients with pronounced falls in serum concentration

Patient	1st AFP value (KU/l)	2nd AFP value (KU/l)	Time interval (d)	Apparent half life (h)
1	>500 a) take 1000 b) take 500	46	12	65 84
2	383	65	7	66
3	175	25	9	77
4	145	27	6	59
5	91	15	8	74

Patient 1 had a very high initial value between 500 and 1000 KU/l; therefore two estimates of half life have been made.