Circulating testosterone concentrations in infants measured by a direct chemiluminescent immunoassay (Bayer ADVIA Centaur) were compared with those measured by a traditional radioimmunoassay using solvent extraction. The results confirm that neonatal circulating testosterone concentrations are method dependent, and each laboratory should establish method related reference ranges especially if using a direct commercial immunoassay. The results indicate that the Bayer ADVIA Centaur procedure can be used reliably in neonates. Expected values for male and female infants < 10 days old were 2.5–11.1 (n = 36) and 1.7–5.6 (n = 36) nmol/l respectively. For older neonates (10–30 days) the ranges were 0.2–17.2 (n = 42) and 0.1–1.5 (n = 7) nmol/l respectively.

Although “direct” commercial steroid immunoassays are reliable in many clinical situations, concerns remain about their accuracy for steroid measurements in young infants. Determination of the plasma concentration of testosterone is an important part of the evaluation of young infants. Selective testosterone is an important part of the evaluation of young infants.1

SUBJECTS AND METHODS

Blood samples were obtained from a group of infants less than 6 months old having other investigations. Ethical approval was obtained from Yorkhill NHS Trust. Testosterone was measured directly by chemiluminescent immunoassay on the Bayer ADVIA Centaur analyser (sensitivity 0.35 nmol/l, coefficient of variation < 7.6%) and an in house radioimmunoassay with a preceding solvent extraction step (sensitivity 0.35 nmol/l, coefficient of variation < 8%).

RESULTS

Table 1 shows the median concentration and range of plasma testosterone as assayed by both the Centaur ADVIA direct immunoassay and the extraction radioimmunoassay in boys and girls less than 10 days old (n = 36 and 36 respectively) and between 10 and 50 days old (n = 42 and 7 respectively). The overall correlation between assays was good (r = 0.88; n = 121). In both boys and girls aged less than 10 days, significantly lower results (p < 0.001) were obtained by the extraction radioimmunoassay. In boys > 10 days, significantly lower results were obtained by the direct procedure (p < 0.001).

DISCUSSION

Concern existed in the literature that commercial assays were inaccurate in the clinical setting of newborn infants when there are high levels of sulphated steroids.1,2 In fact, a spuriously raised testosterone concentration has occurred in our laboratory in a neonatal sample using the Bayer Immuno-1 system, leading to diagnostic confusion.3 In addition, spuriously high adult female testosterone results are known to be produced by some automated analysers.4 Fortunately, no spuriously raised results were obtained by the direct method used in this study. Although results from the two assays correlated well, there were significant differences in the values obtained. For neonates under 10 days of age, significantly lower testosterone concentrations were obtained by the in house extraction assay. This could be related to removal of cross reacting conjugated steroids by solvent extraction. For the older boys, significantly lower results were obtained by the direct assay, which is more difficult to explain. It is, however, clear that the direct assay was specifically developed for measuring testosterone in adults. The testosterone protein binding characteristics in neonatal samples are considerably different from that in adults, and this may affect the accuracy of the measurement. Further studies are required to clarify this issue.

Our results confirm that neonatal circulating testosterone concentrations are method dependent and each laboratory should establish method related reference ranges especially if using a direct commercial immunoassay. In addition to the ADVIA Centaur analyser used in this study, there are at least eight commercial non-radioactive immunoassays for testosterone. Each of these methods has been developed and optimised for measurement of testosterone in adults and should be viewed as suspect in relation to neonatal testosterone measurements unless proven otherwise.

Using the extracted assay, we studied circulating testosterone concentrations in detail in both sexes over the first 6 months of life. As previously reported in boys,1 the concentrations are in general very high at delivery showing a very wide variation, with almost a 10-fold difference.
between some infants. This concentration then falls very rapidly before a slow rise to a second peak at 2 months and then falling to “normal” prepubertal concentrations by 6 months of age. Again there is a very wide variation, with a 10-fold difference between some infants. In girls, there is a much smaller peak at delivery, which then falls to low concentrations over the first week, which remain low over the next six months.

In conclusion, we have shown that there are small differences in measured testosterone concentrations in infancy between a commercial direct assay and one using an extraction step. These differences are, however, unlikely to cause problems in a clinical setting, and it would appear that the widely available Bayer ADVIA Centaur direct assay can be used reliably to measure testosterone in plasma from newborn infants.

**Authors' affiliations**

C Tomlinson, S F Ahmed, Bone & Endocrine Research Group, Department of Child Health, Royal Hospital For Sick Children, Yorkhill, Glasgow G3 8SJ, Scotland, UK

H Macintyre, C A Dorrian, A M Wallace, Department of Clinical Biochemistry, Glasgow Royal Infirmary, Glasgow G4 0SF

Correspondence to: Dr Wallace, Department of Clinical Biochemistry, Glasgow Royal Infirmary, Glasgow G4 0SF, Scotland, UK; MWallace@gri-biochem.org.uk

Accepted 5 March 2004

**REFERENCES**


Testosterone measurements in early infancy

C Tomlinson, H Macintyre, C A Dorrian, S F Ahmed and A M Wallace

Arch Dis Child Fetal Neonatal Ed 2004 89: F558-F559
doi: 10.1136/adc.2003.034017

Updated information and services can be found at:
http://fn.bmj.com/content/89/6/F558

References
This article cites 6 articles, 2 of which you can access for free at:
http://fn.bmj.com/content/89/6/F558#BIBL

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections
Articles on similar topics can be found in the following collections
Reproductive medicine (1433)
Sexual health (91)
Immunology (including allergy) (393)

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/