synthetic sequence just proposed is derived from data on the estrogen receptor, the discovery of microsomal receptors for DHT and progesterone strongly indicates that it is generally applicable to all steroid hormone receptors [2].

Concerning the regulation of receptor biosynthesis and its integration into a scheme of steroid hormone action, some observations can be made. On the basis of results from both the rat and pig experiments, we believe that the receptor is used once only, and that no recycling is involved. Only 10 min after estradiol injection can any heat-exchangeable estradiol-receptor complexes be detected in the soluble phase. These can be accounted for by the small amounts of estradiol still left in the injected solution, which on homogenization occupies free receptor sites *in vitro*. Accordingly, 30 min after injection, when the residual intraluminal fluid is free of estradiol, no exchange is observed. At this same time point, more than 80% of the total uterine estradiol content is found in the particulate ("nuclear") fraction, indicating that *in vivo* newly formed estradiol-receptor complexes are immediately transferred to the nucleus.

Converging lines of evidence – deriving from the receptor biosynthetic receptor sequence and from the *in vitro* interconversion studies [1, 3, 4] – suggest that the (soluble) 5S hormone–receptor complex is the active component *in vivo*. Whether this complex arises by dimerisation of the 4S-hormone–receptor monomer or by addition of a non-hormone binding entity to the 4S unit is still unsettled [1, 4, 5]. The latter possibility is difficult to envisage in view of the fact that the *in vitro* conversions between small and large forms of both the soluble and the structure-bound receptors apparently involve the same mechanisms.

Despite extensive investigations, the reactions underlying the enhancement of transcription by the active steroid receptor complex have yet to be elucidated. Any possible mechanism of action must cope with the simultaneous occurrence of individual receptors for various steroid hormones within a single cell [6].

REFERENCES

1. Little M., Szendro P., Teran C., Hughes A. and Jungblut P. W.: *J. steroid Biochem.* **6** (1975) 493–500.
2. Little M., Szendro P. I. and Jungblut P. W.: *Hoppe-Seyler's Z. physiol. Chem.* **354** (1973) 1599–1610.
3. Brecher P. I., Numata M., DeSombre E. R. and Jensen E. V.: *Fedn. Proc.* **29** (1970) 249.
4. Notides A. C. and Nielsen S.: *J. biol. Chem.* **249** (1974) 1866–1873.
5. Yamamoto K. R. and Alberts B.: *Cell* **4** (1975) 301–310.
6. Wagner R. K., Görlich L. and Jungblut P. W.: *Hoppe-Seyler's Z. physiol. Chem.* **353** (1972) 1654–1656.

12. Estradiol receptor translocation from cytoplasm to nucleus in the embryonic chick mullerian duct cell, C. S. TENG and C. T. TENG, Department of Cell Biology, Baylor College of Medicine, Houston, Texas, U.S.A.

Sex steroids are involved in the normal development of embryonic Mullerian duct (Md). To what extent does steroid hormone effect Md development is not well known. In order to understand the steroid-tissue interaction at the molecular level, an estradiol (E_2) receptor has been isolated from the cytoplasm of 10–15 day embryonic female chick left Md. The embryonic cytoplasmic E_2 receptor has characteristics similar to those of other sex organs previously described. This communication reports that after *in vivo* chorioallantoic injection of E_2 (10–40 μg E_2/egg) to the 15 day chick embryos for 2 h, 45–95% of the initial concentration of E_2 receptor in the cytoplasm of the chick Md cell were translocated into the nucleus. The process of translocation is dependent on the amount of E_2 administered *in vivo*. At 6 h after *in vivo* E_2 administration about 30% replenishment of the initial content of the cytoplasmic receptor was observed in the cytoplasm. The *in vivo* non-radioactive E_2 exposed Md nuclei could exhibit saturable exchange with [^{3}H]-E_2 *in vitro*. The optimal condition for exchange is at 37°–41°C for 1–2 h. The [^{3}H]-E_2 receptor complex extracted from the exchanged nuclei has the sedimentation coefficient of 5–6S, and its isoelectric point is 6·8. The nuclear E_2 binding sites of the developing Md cell were calculated to be 1·66, 2·22, 2·63 and 2·50 pmol/mg DNA (or approximately 2500, 3300, 4000 and 3800 sites/nucleus), the corresponding dissociation constants are 3·0, 3·1, 3·1, and 3·0 nM, for the developmental stages of the 10th, 12th, 15th, and 18th-day embryo respectively. In summary we conclude that: (a) E_2 receptor translocation from cytoplasm to nucleus does take place in the embryonic sex organ. (b) The translocation is dependent on the concentration of the administered E_2 (c) The number of E_2 binding sites in the nuclei increase linearly from day 10 to day 12 of incubation, then level off from day 12 to day 18 of incubation. (Supported by NIH Grant HD-08218-03).

13. Post-transcriptional nuclear control of protein synthesis by progesterone, P. TUOHIMAA and E. SÖDERLING, Department of Biomedical Sciences, University of Tampere, SF-33520, Finland

Avidin is secretory protein of avian oviduct. It is induced by progestagenic compounds. In this study the nuclear and cytoplasmic mRNA activities coding for avidin has been studied up to 24 h after the administration of progesterone. One-day-old immature Leghorn chicks were injected daily with 0·5 mg of diethylstilbestrol in order to stimulate the oviducts to grow. On day 10 they were injected with 5 mg progesterone. Oviducts of 30 animals were pooled for each RNA extraction. Nuclear pre-mRNA was isolated with a sucrose gradient centrifugation, salt and phenol extraction (Georgiev, G. P. & Samarina, O. P., in *Advances in Cell Biology* 2:47, 1971). Cytoplasmic mRNA was isolated with an antibody precipitation of the avidin polysomes. Thereafter the polysomal mRNA was extracted with phenol in the presence of a low salt concentration and high pH (pH 9·0) (Brawerman *et al., Biochemistry* 11 637, 1972). The messenger activity of pre-mRNA and polysomal mRNA was tested in a cell-free system derived from rabbit reticulocytes. The injection of progesterone clearly increases the messenger activity for avidin in the polysomal mRNA fraction. On the other hand, we can find some avidin mRNA activity also in the immature, untreated chick oviducts. Also nuclear pre-mRNA for avidin can be translated in a heterologous cell-free system. However, the messenger activity of nuclear RNA shows changes opposite to that of the polysomal RNA. The avidin coding activity of pre-mRNA decreases to almost zero at 2 h after the administration of progesterone. Concomitantly with the changes of avidin coding activities of nuclear and cytoplasmic RNA there is an enhancement of ribonuclease T_2 activity in the nucleus and cytoplasm. The present results suggest that the transfer and cleavage of the nuclear pre-mRNA may be a consequence of ribonuclease activation and might be a locus of non-transcriptional control of protein synthesis.