The fate of fetal Leydig cells during the development of the fetal and postnatal rat testis

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Summary

The ultrastructure and developmental fate of the fetal generation of Leydig cells of the rat testis was studied from the 17th day of fetal life up to 100 days after birth. The number of fetal Leydig cells per testis was determined by light microscopic morphometric analysis of semithin plastic sections. In fetal testes (days 17–22 postconception), Leydig cells exhibited a characteristic ultrastructure, containing smooth endoplasmic reticulum, many lipid inclusions and glycogen. Testes of 17-day-old fetuses contained about \(25 \times 10^3\) fetal Leydig cells, rapidly increasing to \(90 \times 10^3\) per testis in 21-day-old fetuses. After birth, fetal Leydig cells per testis remained relatively constant up to 2 weeks (80–90 \(\times 10^3\) per testis) and were identified by light and electron microscopy which showed their numerous lipid inclusions, their tendency for clustering and their association with interstitial tissue fibroblasts which partly encapsulated the fetal Leydig cells. From 21–100 days after birth, fetal Leydig cell numbers were quite variable with a mean of 45–60 \(\times 10^3\) per testis. These results are the first to show that the fetal generation of Leydig cells persist in the adult testis and do not undergo early postnatal degeneration or differentiation into other interstitial cells. The simultaneous occurrence of the fetal Leydig cells and the adult population of Leydig cells indicates that these cells are distinct cell generations which are developmentally unrelated.

Key words: ultrastructure, Leydig cells, testis, fetal, rat.

Introduction

The process of Leydig cell differentiation within the fetal and postnatal testis has long been recognized to exhibit a biphasic pattern. Studies of the Leydig cells of the pig testis led Whitehead (1904, 1905) to propose the existence of two populations of Leydig cells, i.e. fetal and postnatal generations. The consensus of opinion since then is that the fetal generation of Leydig cells declines in number just before or soon after birth, followed later by the appearance of the adult generation of Leydig cells around the time of puberty (for review see Christensen, 1975; Gondos, 1977; Prince, 1984). Two suggestions have been offered to explain the prenatal or postnatal decline in fetal Leydig cell numbers: (a) cell death (Sniffen, 1950; Mancini et al. 1963; Pelliniemi & Niemi, 1969; Vilar, 1970) or (b) dedifferentiation or atrophy back to fibroblastic-type cells (Gruenwald, 1946; Ottowicz, 1963; Gondos et al. 1974). Although the morphology of fetal and adult Leydig cells is well recognized in the fetal or adult testis, no convincing evidence favouring either theory has been available, due to uncertainty of the morphology of the interstitial cells during the phases of prepubertal and pubertal maturation of the testis. Quantitative studies of Leydig cells of the rat testis embedded in paraffin wax (Roosen-Runge & Anderson, 1959) suggested an abundance of Leydig cells in the testes of day-19 fetal rats with a sharp reduction in numbers by day 4 of postnatal life and then a rapid development of the postnatal generation of Leydig cells during the third week of life. These findings were extended by Lording & de Kretser (1972) who, using frozen sections, reported a marked postnatal decline in the abundance of fetal Leydig cells, reaching a minimum number 14 days after birth. Tapanainen et al. (1984) also found a peak in Leydig cell number on day 19-5 of fetal life followed by a postnatal decline during the first 3 days after birth. However, other studies of the late fetal and neonatal testis by Zirkin & Ewing (1987) and of the postnatal
testis by Mendis-Handagama et al. (1987) have reported no such early postnatal decline in fetal Leydig cells of the rat testis, although fetal Leydig cells were not observed beyond the third week of life. The objective of the present study was to identify fetal Leydig cells using light and electron microscopy and to quantify their numbers per testis from day 17 of fetal life up to 100 days after birth.

Materials and methods

Animals

Male and several female Sprague-Dawley rats were placed in the same cages overnight and separated the following morning. If females became pregnant, the day after mating was designated as day 0-5 of gestation. The pregnant females were killed by ether inhalation and a minimum of 6 male fetuses were obtained at daily intervals from day 17 to 22 of gestation. After birth, 6–10 male pups were killed by ether inhalation at daily intervals from day 1 to 10 of postnatal life. Thereafter groups of 6–10 males were again killed using ether on days 14, 21, 28, 35, 56 and 100.

Tissue preparation for light and electron microscopy

Testes of fetal rats and postnatal rats up to 10 days after birth were removed, trimmed of connective tissues and fat and immediately placed into fixative solution consisting of 3% glutaraldehyde, 2% formaldehyde and 0.1% picric acid, buffered in 0.2M-sodium cacodylate, pH 7.4. After 30 to 60 min fixation, the testes were weighed and then cut into slices and returned to the fixative for 4–6 h at 4°C. Following postfixation in osmium tetroxide, tissues were stained with uranyl acetate, processed through graded ethanols and embedded in Epon-Araldite. Testes of rats 14 days and older were perfusion-fixed via the thoracic aorta and immediately placed into fixative solution consisting of 3% glutaraldehyde, 2% formaldehyde and 0.1% picric acid, buffered in 0.2M-sodium cacodylate, pH 7.4. After 30 to 60 min fixation, the testes were weighed and then cut into slices and returned to the fixative for 4–6 h at 4°C. Following postfixation in osmium tetroxide, tissues were stained with uranyl acetate, processed through graded ethanols and embedded in Epon-Araldite. Testes of rats 14 days and older were perfusion-fixed via the thoracic aorta and immediately placed into fixative solution consisting of 3% glutaraldehyde, 2% formaldehyde and 0.1% picric acid, buffered in 0.2M-sodium cacodylate, pH 7.4. After 30 to 60 min fixation, the testes were weighed and then cut into slices and returned to the fixative for 4–6 h at 4°C. Following postfixation in osmium tetroxide, tissues were stained with uranyl acetate, processed through graded ethanols and embedded in Epon-Araldite. Testes of rats 14 days and older were perfusion-fixed via the thoracic aorta and immediately placed into fixative solution consisting of 3% glutaraldehyde, 2% formaldehyde and 0.1% picric acid, buffered in 0.2M-sodium cacodylate, pH 7.4. After 30 to 60 min fixation, the testes were weighed and then cut into slices and returned to the fixative for 4–6 h at 4°C. 22 of gestation. After birth, 6–10 male pups were killed by ether inhalation at daily intervals from day 1 to 10 of postnatal life. Thereafter groups of 6–10 males were again killed using ether on days 14, 21, 28, 35, 56 and 100.

Quantitative analysis

The number of fetal Leydig cells per testis was estimated using morphometric methods applicable to semithin sections (0.5–1 μm). Fetal Leydig cells were identified and distinguished from the adult-type Leydig cells according to their histological features described in the Results. From day 17 of fetal life until day 10 of postnatal life, the fixed testes of three animals from each day were allocated for quantitative analysis. Depending on the testicular size, the two or three blocks obtained from each testis represented complete transverse sections through the upper, equatorial and lower pole of the testis. For animals at 2 and 3 weeks of age, five blocks were randomly collected from each of the testes of three animals at each time point. When sectioned each of these blocks was approximately 2–3 mm on edge. For the remaining time intervals (28–100 days), four animals were selected at each time and six blocks, at least 2 mm on edge, were randomly selected from each testis. Fetal Leydig cell numerical density (number of cells per unit volume of testis) was calculated from the Forderus (1944) equation: \( Nv = Na/D + T - 2h \) using methods previously described (Kerr & Sharpe, 1985; Kerr et al. 1987). \( Nv \) is the numerical density, \( Na \) the number of visible cell nuclei recorded within a defined reference area \( a \) of the section, \( D \) is the mean diameter of the nuclei, \( T \) is the section thickness and \( h \) is the height of the smallest recognizable cap or grazing section of the cell nucleus. The reference area, \( a \), was 72,900 μm² (270×270 μm) being that area defined by a square lattice grid inserted into the microscope eyepiece and thus superimposed over the focused section. The number of reference grid areas examined per section varied according to the dimensions of the section. Fetal testes yielded small sections in which 5–10 reference areas were examined per section, whereas in adult testis, 50–100 reference areas were examined for each section. The grid was oriented at random such that the first grid analysis was begun at the top of the section and subsequent areas proceeded towards the bottom edge of the section. No reference areas overlapped and the numbers of recognizable fetal Leydig cell nuclei were recorded regardless of whether the area contained intertubular tissue or seminiferous epithelium (Kerr & Sharpe, 1985; Kerr et al. 1987). Each of the 444 stained sections used in this study were examined using the grid and 15,508 randomly selected reference areas were manually selected using the x40 objective lens. Within these areas, 35,889 fetal Leydig cell nuclei were counted. The mean diameter \( (D) \) of the cell nuclei from all age groups (minimum 400 nuclei per group) was calculated from the measurement of the cross-sectional area of 9995 nuclei using a x63 objective lens linked to a Leitz image analyser. The instrument was programmed to calculate nuclear area after tracing the nuclear outline with an electronic pen. The fetal Leydig cell nuclei are predominantly circular and the measurement of hundreds of nuclei from the testes of all age groups provided a reasonable estimation of their mean diameter which was calculated from the nuclear area. The nuclear diameter of fetal Leydig cells varied with testicular development being larger in fetal testes (up to 7–2 μm) and smaller in postnatal testes (5–2–6.5 μm). Section thickness, \( T \), was either 0.5 or 1 μm as described above and \( h \) was estimated to be one-tenth nuclear diameter as previously described for Leydig cell nuclei (Mori & Christensen, 1980). The number of fetal Leydig cells per testis was obtained by multiplying \( Nv \) by the volume of the same testis from which particular measurements were recorded. As the specific gravity of the rat testis is very nearly 1.0 (Mori & Christensen, 1980; Kerr & Sharpe, 1985) testis weight and volume are very similar, and thus weight measurements were substituted for volume. The mean (±S.E.M.) number of fetal Leydig cells per testis at each time point was then calculated.
Results

Fetal Leydig cells
The 17-day fetal testis was an elongated organ and when cut in transverse section, the seminiferous cords appeared as arches between which was the interstitial tissue (Fig. 1A). Although the interstitial tissue was often filled with variable numbers of primitive mesenchymal cells and fibroblasts, amongst these connective tissue cells were the differentiating fetal Leydig cells, identified by three main morphological features; (a) an ovoid or irregularly-shaped nucleus often containing a nucleolus, (b) a visible rim of cytoplasm, (c) variable degrees of basophilia of the cytoplasm with toluidine blue staining. On day 19 of fetal life, the seminiferous cords became more irregular in their contours and were often observed as arches as well as solid, circular cords of tissue (Fig. 1B). Identification of the fetal Leydig cells was facilitated by their intense basophilia, prominent nuclei often with a nucleolus, and by their rich supplies of cytoplasmic lipid inclusions. A similar morphology was exhibited by the fetal Leydig cells of the 22-day fetal testis (Fig. 1C). Confirmation that the interstitial cells described above were in fact fetal Leydig cells was achieved using electron microscopy. Fetal Leydig cells in fetal testes showed the expected ultrastructural features ascribed to steroidogenically-active cells. They contained a variable amount of cytoplasmic lipid inclusions, tubules and vesicles of smooth endoplasmic reticulum, and mitochondria with tubular and lamellar cristae (Fig. 2A). Some fetal Leydig cells also contained glycogen often partly surrounded by double membranes. Lipid inclusions were a characteristic feature of fetal Leydig cells in 19- to 22-day fetal testes (Fig. 2A) and with electron microscopy they appeared as circular structures of variable electron density due to partial extraction of their contents during tissue preparation. Very similar features were observed in the fetal Leydig cells of the 1- and 5-day postnatal testis where the cells showed considerable density, numerous lipid inclusions and mitochondria with tubular cristae. In the postnatal testis, fetal Leydig cells also formed conspicuous clusters, surrounded by one or more layers of interstitial fibroblasts whilst more centrally, collagen fibres were distributed between the individual cells (Fig. 2B). At 2 weeks after birth, clusters of fetal Leydig cells were associated with slender fibroblasts whose cytoplasm formed a partial capsule around the fetal Leydig cells (Fig. 3A). Lipid inclusions were abundant in the cytoplasm and bundles of collagen

![Fig. 1. Light micrographs of fetal testis interstitial tissue. (A) Day-17 fetus showing fetal Leydig cells (arrows) with a deeply basophilic cytoplasm; (B) day-19 fetus illustrating clusters of basophilic fetal Leydig cells with abundant cytoplasmic lipid inclusions; sc, seminiferous cords; (C) day-22 fetus with fetal Leydig cells containing much cytoplasmic lipid (arrows); sc, seminiferous cords. Bars, 10 μm.](image-url)
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Fig. 2. Ultrastructure of fetal Leydig cells. (A) Day-17 fetal testis, illustrating Leydig cell nucleus (N), cytoplasmic lipid (L), smooth endoplasmic reticulum (er) and mitochondria (m) with lamellar and tubular cristae; (B) day-5 postnatal testis, showing the surrounding cytoplasmic extensions of fibroblasts (arrows). Lipid inclusions are abundant. Bar, 10 μm.

fibres were always present in the adjacent extracellular spaces. Little change in this morphological arrangement was noted in the more mature testes 3, 4 or 5 weeks after birth (Fig. 3B). Fetal Leydig cells were again recognized by their many lipid inclusions, loose clustering and circumferential boundaries of interstitial fibroblast cytoplasm. Within the 56- and 100-day postnatal testis the clusters of fetal Leydig cells exhibited essentially the same ultrastructure as described above (Fig. 3C,D).

Development of adult-type Leydig cells
Within the fetal and early postnatal (day 1–10) testis, the interstitial tissue contained many fusiform-shaped cells occurring in groups or singly and a proportion of these cells develop into the postnatal generation of Leydig cells, identified by their shape and characteristic morphology. Between day 10 and 21 after birth, primitive interstitial mesenchymal cells, representing Leydig cell precursors, now began to show hypertrophy (Fig. 4A) and to adopt the morphological features of immature Leydig cells. Between week 3 and 4, the postnatal development of the Leydig cells was rapid, resulting in an increase in their abundance and size (Fig. 4B). In marked contrast to the fetal Leydig cells, the emerging adult-type Leydig cells were larger, not aggregated into distinct clusters and showed very few, if any, lipid inclusions in their cytoplasm. With further development up to 8 weeks postnatally, the Leydig cells continued their morphological differentiation into the Leydig cells which characterize the adult testis (Fig. 4C). The Leydig cells adopted an irregular shape with complex surface filopodia and cytoplasmic extensions, and the cytoplasm was filled with smooth endoplasmic reticulum and mitochondria. Lipid inclusions were rarely observed. These morphological features of the now fully mature Leydig cells remained essentially unchanged in the testes of 100-day-old rats (Fig. 4D), the only notable alteration being the appearance of variable nuclear shapes ranging from fusiform to irregularly-oval in cross section.

Quantitative studies
On day 17 of fetal life, testis weight (mean ± s.d.) was 0.271 ± 0.006 mg and increased almost tenfold by day 22 of fetal life (2.130 ± 0.046 mg) (Fig. 5). Thereafter, testis weight increased rapidly from 2.64 ± 0.08 mg on the first postnatal day to 1567 ± 40 mg on day 100 of life. When the numerical density ($N_v$; number of cells
Fig. 3. Ultrastructure of fetal Leydig cells. (A) 2-week postnatal testis illustrating a group of fetal Leydig cells flanked by discontinuous processes of fibroblasts (arrows). Lipid inclusions are plentiful and collagen fibres (c) occupy the intercellular spaces; (B) 5-week postnatal testis showing a cluster of fetal Leydig cells partly surrounded by extremely attenuated cytoplasmic processes (arrows); (C) 8-week postnatal testis showing several fetal Leydig cells partly bordered by slender cytoplasmic processes (arrows); (D) Adult testis showing an aggregation of fetal Leydig cells containing many cytoplasmic lipid inclusions. Oval-shaped nuclei (N) are indicated. Bars, 10 μm.
Fig. 4. Ultrastructure of the development of the adult-type Leydig cells. (A) 3-week postnatal testis containing immature Leydig cells which will differentiate into the adult population of Leydig cells. Note the various shaped nuclei (N) within elongated and circular cells; (B) 4-week testis showing another phase of Leydig cell maturation characterized by prominent nucleoli (nl) within oval or circular nuclei and cytoplasm filled with organelles; (C) 8-week testis showing numerous Leydig cells with adult-type features including mitochondria (m) and smooth endoplasmic reticulum (er). A small venule (v) is noted; (D) Leydig cells of the 100-day postnatal testis illustrating the typical adult-type morphology: irregular nuclei (N) often containing a nucleolus (nl) and a highly irregular cytoplasm similar to the 8-week Leydig cells. The seminiferous epithelium (se), interstitial space (is) and a venule (v) are indicated. Bars, 10 μm.
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Fig. 5. Testis weight with increasing age. Each point represents the mean ± s.d. of 10–20 testes. Note log scale for the y-axis.

Fig. 6. Numerical density of fetal Leydig cells with increasing age. Each column represents the mean ± s.d. of 12–48 different tissue blocks. Note log scale on y-axis.

per unit volume) of fetal Leydig cells was calculated the pattern of change with increasing maturation of the testis was the reverse of that recorded for testis weight (Fig. 6). Nv of fetal Leydig cells (×10³ mm⁻³ of testis) was 922 ± 63 (mean ± s.d.) on day 17 of fetal life, increased to 1078 ± 76 on day 18 and gradually declined by day 100 when their numerical density was estimated at 0.35 ± 0.11×10³ cells mm⁻³ of testis. The data for the number of fetal Leydig cells per testis are presented in Fig. 7. Fetal testes on day 17 contained 25 ± 2×10³ fetal Leydig cells (mean ± s.e.m.) and the 21-day fetal testis contained approximately 90 ± 9×10³ fetal Leydig cells, the maximum number measured throughout the study. From day 21 to 100 after birth, the numbers of fetal Leydig cells measured in the testis exhibited a wide variation, ranging from 45 ± 10 to 60 ± 19×10³ cells per testis.

Discussion

This study provides evidence that the fetal generation of Leydig cells is an enduring component of the postnatal rat testis and that they survive within the mature testis together with the adult Leydig cell population. The presence of fetal Leydig cells within the testes of immature and sexually mature rats raises considerable doubts about the perinatal or postnatal disappearance of the fetal Leydig cells (see reviews by Gondos, 1977; Prince, 1984) suggested to occur in several mammalian species including the rat. Some explanation is required to account for these earlier reports of disappearance of fetal Leydig cells from the developing postnatal testis. Three theories have been offered: (1) degeneration and cell death either in utero or around the perinatal period, (2) regression or dedifferentiation into an unidentified fibroblastic cell type and (3) a transformation of the fetal Leydig cells into precursors of the adult-type Leydig cells which contribute to the development of the Leydig cells of the adult testis. However, these suggestions are not based upon convincing evidence although there are significant species differences in distinguishing between fetal and adult Leydig cells, particularly in terms of their temporal separation. An example is the
human testis where the interval between birth and puberty may be 10 years (de la Balze et al. 1960; Mancini et al. 1963; Prince, 1984), whereas this interval in the rat is only 8 weeks (Clermont & Harvey, 1965). The degeneration or cell death thesis has been proposed for the fate of fetal Leydig cells in the human fetal or neonatal testis (Pelliniemi & Niemi, 1969; Hayashi & Harrison, 1971; Vilar, 1970; Holstein et al. 1971; Gondos & Golbus, 1976). Presumably the resident macrophages in the interstitial tissue (Christensen, 1975) would phagocytose any degenerating or pyknotic fetal Leydig cells, but this phenomenon has not been recorded in the human or other nonprimate species (Gondos, 1977; Mendis-Handagama et al. 1987). However, the testes of midgestation human fetuses contain abundant fetal Leydig cells (Gillman, 1948; Mietkiewski et al. 1966; Niemi et al. 1967; Vossmeier, 1971) whereas the considerably enlarged neonatal and early postnatal testes exhibit interstitial cells but they are smaller, possibly less numerous and are classified as immature Leydig cells (Charny et al. 1952; Mancini et al. 1963; Prince, 1984). Light microscopic studies of human fetal testes embedded in paraffin (Gillman, 1948; Mancini et al. 1963; Mietkiewski et al. 1966) or epoxy resin (Pelliniemi & Niemi, 1969) have proposed that the fetal Leydig cells undergo hyperchromatosis and pyknosis, leaving few recognizable Leydig cells within the loose interstitial connective tissue. However, in the present study of fetal rat testes, it was also possible to define areas of interstitial tissue which are devoid of fetal Leydig cells and contain only loose edematous connective tissue, an observation noted earlier by Clermont & Huckins (1961). Nevertheless the developmental history of fetal Leydig cells in other mammalian species is very different from the human. In the mouse, rat, guinea-pig and rabbit testis, fetal Leydig cells are numerous just before and soon after birth (Roosen-Runge & Anderson, 1959; Black & Christensen, 1969; Lording & de Kretser, 1972; Bjerregaard et al. 1974; Pehlemann & Lombard, 1978; Mendis-Handagama et al. 1987; Zirkin & Ewing, 1987) which supports the observations of the present study. Other suggestions that the fetal Leydig cells regress and/or begin to disappear before or just after birth in the mouse, rat, hamster and rabbit (Russo & de Rosas, 1971; Gondos, 1977; Gondos et al. 1974, 1976) must now be viewed with some caution.

In contrast to the reported disappearance of rat fetal Leydig cells within 14 days after birth (Roosen-Runge & Anderson, 1959; Lording & de Kretser, 1972), we show that their numbers per testis remain unaltered during the same time span. Recently Zirkin & Ewing (1987) showed that testes of day-18 to -20 fetal rats and rats of days 2–3 after birth contained the same number of fetal Leydig cells. Similar observations were reported in postnatal rats by Mendis-Handagama et al. (1987) although the number of fetal Leydig cells per testis at 10 days was twice that on day 1 after birth (126 ± 16 \( \text{versus} \) 65 ± 6 \( \times \) 10^3 respectively; mean ± s.e.m.), a finding not confirmed by the present study. Since the fetal Leydig cells become progressively more difficult to identify as their \( N_v \) declines, the impression gained from a simple inspection of a tissue section is one of rapidly diminishing numbers of fetal Leydig cells. This observation may explain why the \( N_v \) of fetal Leydig cells exhibited large variation in the testes of 21- to 100-day-old rats. The extension of the analysis to include more sections and reference areas may decrease the variation both in \( N_v \) and the estimated numbers of fetal Leydig cells per testis. Alternatively, the estimated decline in their numbers at these times may indicate a true cell degeneration/death or dedifferentiation into interstitial cells not classified as Leydig cells. Our observations did not provide any evidence of degeneration or pyknosis, two phenomena well characterized in the adult rat testis when the mature Leydig cells are selectively destroyed by the cytotoxic drug ethane dimethane sulphonate (EDS) (Kerr et al. 1985, 1986; Bartlett et al. 1986; Jackson et al. 1986; Morris et al. 1986) and are eliminated from the testis via the phagocytic activity of the adjacent interstitial macrophages. EDS given to 5-day-old rats also destroys the fetal Leydig cells (Kerr et al. 1988) but we did not observe degeneration of fetal Leydig cells in this study nor their engulfment by macrophages.

The reported absence of fetal Leydig cells in the rat testis at 90 days of age has been interpreted as evidence of their transformation into precursors of the adult population of Leydig cells (Mendis-Handagama et al. 1987). However, the present results showing their persistence in 100-day-old testes favours the view that the adult Leydig cells are derived not from fetal Leydig cells but rather from primitive interstitial mesenchymal cells (Christensen, 1975). Following the elimination of fetal or adult Leydig cells with EDS (Kerr et al. 1987, 1988; Zaidi et al. 1988), a new generation of adult-type Leydig cells develops from peritubular and perivascular mesenchymal cells. Chemes et al. (1985) also described the development of Leydig cells from mesenchymal cells when prepubertal boys were treated with human chorionic gonadotrophin, a potent stimulator of Leydig cell differentiation. Thus it is likely that the fetal Leydig cells represent a distinct class of cells incapable of transformation into the Leydig cells which develop in the postnatal testis.

Why does the testis exhibit two growth periods of Leydig cells, in fetal then in postnatal life? The physiological function of the fetal Leydig cells is to

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**References:**
- Zaidi et al. (1988).
- Chemes et al. (1985).
supply adequate concentrations of androgens for masculinization of the developing fetus (Jost et al. 1973; Donovan, 1980; Wilson et al. 1983; Bykov, 1986; Dohler, 1986). Fetal Leydig cells show higher endogenous steroid concentrations per cell compared to the immature and mature Leydig cells of the postnatal Leydig cell population and the ratio of C19:C21 steroids is characteristically low (Tapanainen et al. 1984). This increased steroidogenic activity is enhanced by gonadotrophic stimuli (from the fetal pituitary or the placenta) and unlike adult Leydig cells which display LH-receptor down-regulation and steroidogenic blockade when exposed to high levels of LH or hCG (Huhtaniemi et al. 1982, 1984; Warren et al. 1987), the fetal Leydig cells continue active steroidogenesis. When the postnatal adult Leydig cells are formed, their steroid secretory profile is very different from fetal Leydig cells and is characterized by increased ratios of C19:C21 steroids, i.e. much more total testosterone and 5α-reduced metabolites are secreted in conjunction with the establishment and maintenance of spermatogenesis (Tapanainen et al. 1984).


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