Workshop Report

Post-menopausal Estrogen Production

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The Pre-menopause

Before the menopause the main source of estradiol is direct secretion by the ovaries. Over 90% of estradiol comes from this source. About 50% of estrone results from secretion by the ovary, the remainder originates from the peripheral conversion of androstenedione to estrone and from estradiol to estrone. Substantial amounts of androstenedione are secreted by the ovaries and adrenals, with larger contributions coming from the adrenals.

Of the testosterone production, 60–70% arises from the peripheral conversion of androstenedione to testosterone, with some secretion by ovaries and adrenals.

The Peri-menopausal Period

Data on actual hormone secretion by the ovaries during the peri-menopausal years are lacking, although there appears to be a gradual alteration in the steroid secretory pattern of the ovary. Plasma levels of estrogens and of androgens appear to decline slowly during those years. In the first 3 years following the cessation of menstruation this decline seems to continue.
The Post-menopause

Data discussed in the ensuing paragraphs are gathered from studies of women more than two years after their menopause.

**Plasma Levels**

From the data presented, it appears that plasma levels remain stable. For estrone, mean values range from 20-40 pg/ml, and for estradiol from 9-15 pg/ml. Urinary excretion of estrone and estriol also remains stable. There seems to be a small decrease in estrogen activity as measured by urinary sediment cytology. The reason for this discrepancy remains to be elucidated.

Plasma androstenedione levels remain stable at 0.6-0.9 ng/ml, while testosterone levels range from 0.2-0.3 ng/ml. There appears to be some fluctuation in the testosterone level in relation to age, changes that are statistically significant, but of doubtful physiological significance.

**Blood Production Rates**

The metabolic clearance rates of both androgens and estrogens are slightly lower in post-menopausal women. A decrease by 10-20% compared to pre-menopausal women was observed. Until the age of 75, there apparently is no decline in the clearance rates of either androgens or estrogens. Therefore the blood production rates, calculated from the plasma levels and the metabolic clearance rates, remain essentially unchanged from two years after the menopause.

The blood production rate for estrone amounts to about 40 µg/day, for estradiol about 10 µg/day, for androstenedione 1.5 µg/day and testosterone about 150 µg/day.

**Biogenesis of Estrogens**

Estrogens in post-menopausal women originate almost completely from the so-called peripheral conversion of androgens to estrogens. Due to inherent errors in the methodology used, a minimal contribution from direct secretion by the ovaries and/or adrenals cannot be