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**CHANGES IN OESTROGEN AND PROGESTERONE**

Oestrogen and progesterone are also the chief hormones throughout pregnancy. During pregnancy, oestrogen levels rise to promote maternal blood flow within the uterus and the placenta. This ensures that the fetus is supplied with the required amount nutrients and oxygen for its development, and that waste products from the foetus are removed in the mother’s blood. The progesterone levels are also very high and this results in increase in size of the uterus, allowing it to accommodate the foetus. It has other effects on the blood vessels and joints.

**CARDIOVASCULAR**

Cardiac changes are relatively minor and reverse soon after childbirth. The muscles of the heart (myocardium) enlarge slightly because of an increased workload during pregnancy, but the heart adapts to the increased cardiac demand that occurs during pregnancy in various ways.

Cardiac output increases throughout early pregnancy, and peaks in the third trimester, about 30-50% above the normal range. Oestrogen mediates this rise in cardiac output by increasing the pre-load and stroke volume, through a very high overall blood volume. Heart rate increases, but not above 100 beats/ minute. Total systematic vascular resistance decreases by 20% secondary to the vasodilatory effect of progesterone. Overall, the systolic and diastolic blood pressure drops 10–15 mm Hg in the first trimester and then returns to normal in the second half of pregnancy. These changes in the cardiovascular makeup of the mother can lead to common pregnancy symptoms, such as palpitations, decreased exercise tolerance, and dizziness. During pregnancy some heart sounds are considered abnormal in a normal state. The changes are first observed between 12 and 20 weeks and drop during the first week after childbirth. The most common variations in heart sounds include splitting of the first heart sound and a third heart sound. A systolic murmur is also found and may persist beyond the 4th week postpartum.

**BLOOD VOLUME**

Total blood volume of a pregnant female increases by as much as 45%. Plasma volume increases progressively from the 6th to 8th week of gestation until the 32nd week. Plasma volume increases are greater in multiple pregnancies. The increase may be due to vasodilation from estrogen and progesterone stimulation of the renin-angiotensin-aldosterone system, which stimulates sodium and water retention. The increased volume is to ensure transport nutrients and oxygen to the placenta, where they become available for the growing fetus, and prevents the side effects of the blood loss that occurs during parturition.

Erythrocyte mass increases by 250 to 450 ML which is less than that of the plasma. The dilution of RBC mass causes a decline in maternal hemoglobin and hematocrit. This condition is called physiologic anemia or pseudoanemia of pregnancy. It does not indicate true anemia. Dilution of RBCs by plasma may also have a protective function by countering the occurrence of clots (thrombosis) that are capable of obstructing maternal blood vessels.

**BREAST**

During pregnancy, the breasts undergo change in size and appearance. Estrogen stimulates the growth of mammary ductal tissue, while progesterone promotes the growth of lobes, lobules, and alveoli. The breasts become highly vascular, making a delicate network of veins visible. An increase in the breast size is ample, lineal tears in the connective tissue (**“**stretch marks”) may develop. The nipples enlarge, become darker and more erect. The areolae become larger and more pigmented. Women with very light complexions exhibit less change in pigmentation than those with darker skin tones. The Tubercles of Montgomery, become more prominent during pregnancy and secrete a lubricating substance for the nipples. In addition, a thick, yellowish fluid **(colostrum)** is present beginning at 12 to 16 weeks of pregnancy and can readily be expressed from the breasts by the third trimester. Secretion of milk is suppressed during pregnancy by high levels of estrogen and progesterone.