LABORATORY 29 - FEMALE REPRODUCTIVE SYSTEM (third of three laboratory sessions)
PLACENTA AND UTERUS OF PREGNANCY, MAMMARY GLAND

OBJECTIVES: LIGHT MICROSCOPY: During different stages of gestation, recognize characteristics of the fetal and maternal regions of the placenta, including villi and cell types. Observe other regions of decidua. Recognize characteristic appearance of mammary gland prior to and during pregnancy including ducts and alveoli.

ELECTRON MICROSCOPY: Recognize mammary gland, alveoli, and the characteristics of the secretory cells.

ASSIGNMENT FOR TODAY'S LABORATORY

GLASS SLIDES

SL 145 Placenta and uterus
SL 146 Placenta at term
SL 147 Pregnant uterus, decidua parietalis
SL 35 Umbilical cord, 5 months pregnancy
SL 148 Umbilical cord, at term
SL 149 Mammary gland, immature
SL 150 Mammary gland, inactive
SL 151 Mammary gland, 7th month of pregnancy
SL 153 Mammary gland, lactating
SL 154 Mammary gland, regressing
SL 155 Nipple of breast
SL 100 & 101 Review

POSTED ELECTRON MICROGRAPH

S-104 Mammary gland
Lab 29 Posted EMs

HISTOLOGY IMAGE REVIEW - available on computers in HSL
Chapter 17, Female Reproductive System, Placenta and Mammary Gland
Frames: 1176-1196

SUPPLEMENTARY ELECTRON MICROGRAPHS

Rhodin, J. A.G., An Atlas of Histology
Copies of this text are on reserve in the HSL.
Female reproductive system - placenta and mammary gland pp. 415 - 422

PLACENTA AND UTERUS OF PREGNACY

A. PLACENTA - Gross specimen (Review W. 19.27 to 19.29). Fixed tissue demonstration - full-term human placenta. Note the appearance of the gross specimens. On the maternal side identify cotyledons and basal plate. On the fetal side identify the chorionic plate, amnion, umbilical cord with blood vessels spreading from it over the chorionic plate. How does the disc-shaped placenta develop from the spherical chorion frondosum?

B. PLACENTA AND UTERUS, 5 months pregnancy. SL 145 (W. 19.27 to 19.32 and 19.34).

1. Fetal portion of the placenta.

   Chorionic plate with a stem villus (stem villus may not be present on all slides) (chorionic plate, red arrows; stem villus, blue arrows). Branches from stem villi (1, 2) with many ramifications and free floating ends have been sectioned at many different angles. Within the various-sized villi note branches of fetal blood vessels, connective tissue, cytotrophoblast and syncytial trophoblast (cytotrophoblast, red arrows; syncytial trophoblast, blue arrows). Projections from the syncytium may appear in the intervillous space as "giant cells". Where trophoblast meets decidua, forming "anchoring villi", there is a proliferation of cytotrophoblast and a development of fibrinoid to form the basal plate (anchoring villi, green arrows; cytotrophoblast, blue arrow; fibrinoid, red arrows).

   Maternal portion of the placenta and uterus (1, 2)

   (a) Maternal (intervillous) blood spaces; decidua basalis with trophoblast cells and blood vessels communicating with the intervillous space; remnants of the basal endometrium and glands.

   (b) Myometrium (between green arrows).

C. PLACENTA AT TERM, removed from uterus. SL 146 (W. 19.33) Compare the development to that at 5 months. Note:

1. Thick chorionic plate and amnion (blue arrows).

2. More complex development of the villi, syncytial trophoblast only, more areas of fibrinoid, syncytial "knots" (red circles).

3. In the basal plate (blue arrows), fibrinoid is abundant and trophoblast cells are frequent. Very little decidua remains attached to the basal plate.

D. PREGNANT UTERUS through the decidua parietalis. SL 147 (scan, low, med).

Note the absence or thinning of the surface epithelium, and the functional zone of the endometrium with decidual cells and blood vessels thin epithelium, green arrows; blood vessels, red arrows; decidual cells, blue arrows, and the basal zone with glands (base of glands, blue arrows).

E. UMBILICAL CORD, 5 months pregnancy. SL 35 (low, med).
At term – SL 148 (low, med) (W. 19.35) Note:

1. Amnion and stroma.

2. Stroma - type of tissue? - more fibrous in SL 148.

3. Two umbilical arteries and one vein. Sometimes difficult to distinguish because their walls are not always well developed. The vein is more central. Vessels constricted, leading to an apparent increase of connective tissue area ("mucoid" connective tissue).

MAMMARY GLAND

The duct system of the mammary gland proliferates at puberty, but only minimal growth of alveoli occurs prior to pregnancy when the gland becomes active. In this group of slides observe the increase in glandular tissue in the active versus the inactive gland. With the commencement of lactation, cellular changes are evident in the alveolar cells in addition to the extensive growth of glandular tissue.

A. IMMATURE MAMMARY GLAND, 11 year old child. SL 149 (low, med). (similar to W. 19.38).

Note:

1. Density of the stroma and the amount and distribution of fat.

2. Ducts and alveoli are indistinguishable. Can you see myoepithelial cells?

3. Stroma around the developing gland is less fibrous and more cellular than surrounding c.t.

B. INACTIVE MAMMARY GLAND, just deep to areola, adult. SL 150 (low, med). (W. 19.38)
Within the loose stroma observe lymphocytes and plasma cells (normal). Ducts may include interlobular, intralobular, and lactiferous. Compare the epithelia and surrounding stroma. Some slides may have typical apocrine sweat glands of the areola.

C. MAMMARY GLAND of PREGNANT WOMAN, 7th month of pregnancy. SL 151 (low, med). (W. 19.39)

1. By this stage of development there the changes in proportions of glandular tissue and stroma, lobes and lobules and larger ducts are readily observed.

2. Compare with the inactive gland regarding the size of alveoli and the presence of myoepithelial cells (nuclei of myoepithelial cells, red arrows).

3. Observe that some types of free cells are more numerous in the modified stroma around alveoli.

D. LACTATING MAMMARY GLAND. SL 153 (low, med). (J. 22-29; W. 19.40)

1. Compare to the slides above. Many of the glandular cells of the alveoli have apical regions where fat droplets appear signifying that lactation has started. Most, if not all of these droplets have been dissolved from the section. Try to distinguish between active and resting alveoli.

2. The stroma also shows indications of increased activity around the alveoli, with an increase in several cell types including plasma cells, lymphocytes and granulocytes.

3. Electron microscopy – Compare the mode of secretion of protein and lipid components of milk. (J. 22-30; W. 19.41).

E. REGRESSING MAMMARY GLAND SL 154 (low, med). Section near the nipple, 10 days postpartum (child had not been nursed).

1. Note indications of returning to the inactive state.

2. Lactiferous ducts, surrounded by connective tissue may be seen regressing at one end of the section.

F. NIPPLE OF THE BREAST - female. SL 155 (scan, low, med). Note epidermis, dermis, subcutaneous tissue with scattered bundles of smooth muscle cells (blue arrows), and lactiferous ducts (red arrow) surrounded by connective tissue and smooth muscle.

REVIEW

1. Slide 100 (low, med). These sections of the uterine endometrium were taken after curettage. Examine the stroma and epithelium and determine the stage of the menstrual cycle at the time of curettage. See the slide number index for identification. What were the morphological features that helped you make your decision? What ovarian structure and its hormones influenced the endometrium? How did this ovarian structure become functional? What other ovarian structure preceded this structure? What hormones did it liberate? Target organs? What organ is responsible for its growth? What controls that organ?

2. Slide 101 (low). These sections were also taken after curettage. What part of the reproductive tract did they come from? What hormones influence the secretions of this tissue? Can changes be detected in the secretions during the menstrual cycle? What is the significance of these changes? See the slide number index at the end of the Lab Manual for identification. (See W. 19.25)

3. Describe the barrier between fetal and maternal blood in a two month fetus versus a fetus at term.

4. Briefly, what characterizes stem villi and anchoring villi?

5. What histological changes are evident in an inactive mammary gland versus the mammary gland of a pregnant woman, versus a lactating mammary gland?

OBJECTIVES FOR LABORATORY 29: FEMALE REPRO. – PLACENTA & MAMMARY GLAND

1. Using the light microscope or digital slides, identify:

- Placenta – note you will not need to distinguish developmental age of placenta
  - Fetal portion
    - Chorionic plate
      - Amnion
    - Stem villi
      - Mesenchyme
      - Cytotrophoblast
      - Syncytiotrophoblast
        - Syncytial knots
    - Anchoring villi (same substructures as stem villi)
  - Maternal portion
    - Basal plate
      - Fibrinoid
      - Decidual tissue
    - Myometrium
  - Decidua parietalis
    - Decidual cells
- Umbilical cord
  - Amnion
  - Mesenchyme
- Mammary gland
  - Cells and structures
    - Lobes and lobules
    - Secretory cells
    - Myoepithelial cells
    - Acini
    - Ducts
    - Stroma
      - Plasma cells and other lymphocytes
  - Stages
    - Inactive
    - Mammary gland of pregnancy
    - Lactating mammary gland
    - Regressing (difficult to distinguish from poorly preserved tissue)
- Nipple
  - Lactiferous ducts

2. On electron micrographs, identify:

- Mammary gland
  - Acinar cells
    - Lipid product
    - Protein product
  - Myoepithelial cells