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Microscopic Observations on Circulatory Systems of Living Transilluminated Mammalian Spleens and Parturient Uteri.*

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A. Spleens.—The circulatory system of living spleens of mice, rats, and cats, were studied. The spleens were exposed through a small incision and *vigilantly* protected from minute temperature changes and trauma to prevent general vasomotor upsets in the organ. The spleens were transilluminated, using only the visible spectrum, by means of the previously described[1] quartz rod light. The linings of blood vessels, including sinuses, in living spleens, show as clear refractile borders, not to be confused with peripheral plasma layers of the blood. These linings are as continuous in living spleens as in other organs. Each vessel that I traced connected to both the arterial and the venous system; neither open ends nor blind ends of vessels were found. I saw blood pass through the red pulp via (1) long straight capillaries, (2) via the venous sinus systems and (3) via diapedesis, but I have not yet seen other types of passage. The distribution of blood to various areas and subareas of the red pulp is actively controlled by coordination of the action of powerful sphincter-like segments of branches of the arterial tree. Venous sinuses have a cycle of filling, storage and emptying. During filling the efferent end of the sinus is tightly contracted, whole blood flows into the sinus, plasma filters rapidly out of the sinus into the partitions which are usually termed pulp cords, leaving the sinus distended up to 20 to 50 times its original diameter with solidly packed blood cells. The retention of blood cells lasts from a few minutes to several hours. At emptying, the efferent end of the sinus relaxes suddenly, the packed blood cells emerge in masses, and the sinus decreases in diameter, quickly, until it is but 2 or 3 times the diameter of a red blood cell and then it conducts blood like any other blood vessel. The spleens of digesting animals are large because many sinuses are distended with packed cells. The spleens of exercised or frightened animals are small because most of the sinuses are not storing, but conducting, blood. Administra-

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[1] Knisely, M. H., *Anat. Rec.*, 1934, **58**, 73.

tion of adrenalin causes the sinuses to empty out their stored blood cells.

During the brief death period of an animal there is a rapid diapedesis of red cells, out of capillaries, in all directions through the red pulp, a disappearance of capillary walls, an intense phagocytosis of red cells, by phagocytes, and rouleaux formation in the sinuses and venules. Agonal changes in the red pulp during the 3 to 5 minutes of the death of the animal may possibly explain the "open" circulatory system as seen in some histologic sections.

B. Parturient uteri.—The living uteri of 6 parturient house mice (*Mus musculus*) were studied, using lens combinations with magnifications up to 100 X. The animals were opened, under light ether, without blood loss, by a para-midline incision, the viscera protected *carefully* from thermal and mechanical trauma, and the uteri and adnexa transilluminated with the quartz rod light. Each of the 2 to 5 branches of the uterine artery supplying a placental site has an especially contractile segment (similar to that in an arteriovenous anastomosis) located near the entrance of the branch into the uterine wall. Contraction and relaxation cycles of these sphincters control the volume of blood supplied to a placental site preceding, during and following parturition. At the site of the lowest attached foetus brief partial contractions of the arterial sphincters alternate with long relaxations. Gradually the duration and degree of contraction change until contractions and relaxations are equal and each contraction completely obliterates its branch's lumen.

The sphincter's contractions later become long and powerful with very brief, partial relaxations. The foetus and foetal side of the placenta at this time are cyanotic while the maternal side of the placenta and uterine wall are blanched and nearly bloodless. The uterine musculature at the level of the attached placenta (Rudolph & Ivy)[2] begins powerful rhythmical contractions. (Smooth muscle of the gut also undergoes strong contractions when its blood supply is cut off.) During a strong, *localized* uterine contraction the foetus and placenta break away and start down the tube, and the sphincters remain tightly closed, preventing hemorrhage. Brief partial relaxations prevent blood loss while a clot is formed at the placental site. The relaxations of the sphincters become longer and the contractions shorter until after half an hour when a clot is well established, the uterus receives a normal blood supply again.

[2] Rudolph and Ivy, *Am. J. Obstet. and Gynec.*, 1930, **19**, 317.

The cycles of adjacent sphincters are out of phase at all times so that the uterine musculature frequently gets a *little* blood through each, even during the detachment of the foetus and placenta. In so small an animal the loss of a little blood is serious. This mechanism conserves blood so well that free blood is hardly ever seen in the uterine lumen. The *localized* interruption of the blood supply of the uterus at a placental site may be one link in the chain of events initiating delivery.

7619 C

Anterior Pituitaries of Infantile Female Rats Receiving Injections of Pregnancy Urine Extract.*

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Many investigators have demonstrated that injections of pregnancy urine or human placental extracts into immature (21-day or above) female rats result in an increase in the size of the ovaries due to follicular maturation and corpus luteum formation. However, subsequent studies of Selye and Collip[1] have revealed that injection of such extracts into infantile female rats (6 to 8 days) fails to cause follicular maturation and development of corpora lutea, but does result in a marked increase in the size of the thecal cells giving rise to thecal corpora lutea.

Collip and associates[2] have found that injection of placental extracts increases the size of the pituitaries of immature female rats (21 days or above) as well as the ovaries. We have confirmed these results, using both extracts of human placentae and pregnancy urine.†[3-5] Histologically, the pituitaries of these rats exhibited a

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[1] Selye, H., and Collip, J. B., PROC. SOC. EXP. BIOL. AND MED., 1933, **30**, 647.

[2] Collip, J. B., Selye, H., Thomson, D. L., and Williamson, J. E., PROC. SOC. EXP. BIOL. AND MED., 1933, **30**, 590.

† Pregnancy urine extract, Follutein, was furnished by E. R. Squibb & Sons through the courtesy of Dr. J. J. Durrett.

[3] Wolfe, J. M., Phelps, D., and Cleveland, R., PROC. SOC. EXP. BIOL. AND MED., 1933, **30**, 1092.

[4] Wolfe, J. M., PROC. SOC. EXP. BIOL. AND MED., 1934, **31**, 812.

[5] Wolfe, J. M., *Am. J. Physiol.*, in press.