unfeathered area exposed. Female chickens between 4 and 10 weeks of age require about double the irradiation needed for male birds of the same age. This is because the combs of the females are still small and rudimentary. Those of the males have usually begun to develop at 4 to 5 weeks, and have good circulation. The greater improvement of the males, when short exposures are given, is due to the greater uncovered area of their bodies and not to a sex difference.

The feathers of chickens prevent the rays from reaching the body.

Exposure of the unfeathered parts of the legs to ultra-violet rays, for 5 minutes daily, caused as rapid recovery as "total irradiation" for the same length of time.

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Experiments on Pleural Permeability.

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In connection with an extensive study on pleural effusions, it became necessary to collect data on the permeability of the normal pleura. Experimental data from the literature indicate a high degree of permeability; and Hamburger[1] in particular states that intraperitoneally or intrapericardially injected fluids are quickly changed to isotonicity with the blood serum and are then promptly resorbed. But we did not find any quantitative data which would answer our problem.

Several series of experiments on rabbits were performed; they all reveal, in accordance with previous workers, a very high degree of permeability of the pleural membrane. Two representative series of experiments will suffice to show the ready exchange which takes place between pleural cavity and blood.

In the first experiments the right pleural cavity of 9 rabbits was injected with 10 cc. of sterile, distilled water. The animals were killed 5, 7½, 15, 30, 45, 60, 120, 180, and 240 minutes after the injection. All fluid in the right pleural cavity was collected immediately, measured and examined (depending on a sufficient amount) for chlorides, glucose, sodium, calcium, nonprotein nitrogen, total serum nitrogen, magnesium and potassium. Immediately before death, a sufficient amount of blood was obtained from the carotid

[1] Hamburger, H. J., *Arch. f. Anat. u. Physiol., Physiol. Abtlg.*, 1895, 281.

artery of each animal for the performance of the same determinations. Since the actual amounts of the various constituents showed considerable variation in the different animals, we have calculated the ratio of the concentration in the pleural fluid to the concentration in the blood, for each constituent determined. The ratios increase rapidly throughout the period of observation, although at a different rate for the various constituents. That the permeability of the pleura for a substance is not simply a function of the size of the molecule is indicated by the fact that the concentration of glucose in the pleural fluid reaches 100% of the blood value more quickly than does that of some inorganic components. Equality between pleural fluid and blood is established for chloride within 30 minutes, for glucose in 50 minutes, for potassium in 3 hours. Sodium, calcium and magnesium reach 70 to 80% of the blood plasma values within 1 hour. Nonprotein nitrogen is 50% after 30 minutes, while the total nitrogen, determined only during the first 15 minutes, is 15% of the serum nitrogen. The total amount of fluid decreases to 3.5 cc. during the first half hour; at the end of 6 hours the pleural cavity is dry. It is thus shown that, although the tendency to osmotic equilibrium is obvious throughout the course of the experiment, resorption begins before isotonicity is reached.

In a second series of experiments, rabbits were injected in the same way as above but with hypertonic solution containing potassium chloride, glucose, and calcium lactate, the analysis of which revealed the following composition: potassium 432 mg., glucose 472 mg., calcium 44.5 mg., chlorides 357 mg., per 100 cc. Within the first hour after injection, the glucose concentration in the artificial pleural fluid is equal to that of the blood; the calcium content decreases during the same period from 350 to 250% of the blood value; potassium decreases to equality with the blood plasma content. At the same time, sodium and nitrogenous substances enter the pleural space, to the extent of 50 and 4% of the blood concentration, respectively. The resorption of the fluid is somewhat less rapid during the first half hour, but more rapid thereafter, than in the animals which had received distilled water.

Extensive chemical data upon spontaneous pleural effusions in humans show that the composition of these fluids is qualitatively and quantitatively in no essential way different from that of the blood plasma. This fact indicates clearly, in combination with the high degree of permeability demonstrated experimentally, that the failure of resorption in disease is not a function of the chemical composition of the effusions, but that it must be explained by the altered permeability of the pleural membrane.