the other seven animals were killed sixty-four days after being placed on the diet (age about one hundred and fourteen days). The animals in cage "U–V" (rayed animals) were exposed to the radiations at a distance of three feet for varying periods of time daily for sixty-four days and were then killed.

The rayed animals as contrasted with the control animals showed marked physical vigor as evidenced by growth, activity, good appetite, thick smooth coats and reproductive power.

Autopsies showed the rayed animals to be larger than the controls and to have great increase over the controls in the amount of fat deposition and muscular development. The rayed animals showed no evidence of rickets. The control animals showed enlargement of the epiphyses of the long bones, deformities of the thorax, enlargement of the costo-chondral junction and fractures of the ribs. Histological examination showed the long bones of the rayed animals to be normal and those of the control animals to have typical rickets.

The effects of the radiations of the mercury vapor quartz lamp on the growth and calcification of the skeleton of the rat and on the animal as a whole seem to be similar if not identical with those brought about by direct sunlight and by cod liver oil.

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## Collodion sacs for aërobic and anaërobic bacterial cultivation.

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The collodion sacs demonstrated before this society a year ago,[1] while suitable for intraperitoneal implantation are not so well adapted to microbic cultivation *in vitro*. We have therefore been making sacs of 5–10 c.c. capacity in test tubes lined with a dried film of gelatin[2] which softens in warm water and permits the easy removal of the collodion membrane. The sac is slipped on to a supporting glass tube, inserted into one limb of a V-shaped

[1] PROC. SOC. EXPER. BIOL. AND MED., 1920, xviii, 92. *Jour. Exper. Med.*, 1921, xxxiii, 25.

[2] The 10 per cent. gelatin solution is preserved with 0.3 per cent. tricresol.

tube, open at both ends, and sealed in place with a collar of rubber tubing. Sac and V tube are partly filled with water, plugged with cotton and sterilized in the autoclave. Shrinkage during sterilization may be avoided by maintaining a pressure of 10–12 cm. of water in the sac. The sac may even be expanded by this method, but its permeability apparently is not thereby increased.

After sterilization the chosen medium is placed within the sac, and dialysis of nutritive and growth-promoting substances occurs into the surrounding fluid, which is accessible for inoculation through the other limb of the V tube. For anaërobic cultivation both medium and dialysate may be layered with vaseline. The vaseline seal excludes oxygen, but also retains $CO_2$ and may therefore tend to a more rapid acidification of the medium.

Osmotic pressure adjustments take place automatically by changes in the levels of medium and dialysate. With experience the approximate osmotic pressure of a given medium may be anticipated and the passage of water into the sac may be avoided by filling it with medium to a higher level.

These sacs were prepared especially for use with the Smith-Noguchi fresh tissue medium. This medium, consisting of ascitic fluid or dilute serum and a fragment of fresh rabbit kidney or testicle is placed within the sac, in the dialysate of which we have grown subplants of *T. pallidum*, *S. microdentium* and *Bacterium pneumosintes*. Thus the organisms have been obtained free from the confusing, antigenic, protein precipitate which develops in the tissue medium. The addition of dextrose broth hastens the establishment of anaërobic conditions.

For mass cultures the sacs have been formed in gelatin-lined Erlenmeyer flasks, and enclosed in larger flasks with a glass tube, or spout, fused into the side near the bottom.

A full description of the sacs will appear in a forthcoming number of the *Journal of Experimental Medicine*.