

cent. of the anhydrous salt, euglobulin and pseudoglobulin I. After the ingestion of colostrum containing these globulins relatively large quantities of the proteins appeared in the serum. Subsequent data have shown that there is evidence of absorption of the proteins within 3 to 4 hours and a very marked accumulation of the proteins 6 hours after receiving colostrum. Furthermore, we have one case in which both the agglutinins (Little) and the globulins decrease in amount with increasing age. The time and conditions of the formation of the globulins is being studied. The demonstration that the agglutinins are associated with the globulin fractions of the proteins of blood and colostrum and their absorption by young animals tends to support the idea of direct absorption into the blood of newborn calves of certain protein fractions present in colostrum.

The conception of a direct absorption of agglutinins and protein by the young animals based upon biological reactions has appeared repeatedly in the literature relating to the transmission of immunity. The absence of a substance reacting with colostrum antiserum in the blood of newborn calves which is acquired after the ingestion of colostrum has been demonstrated by Langer.<sup>1</sup> The acquirement of relatively large quantities of particular protein fractions by the newborn and the association of the agglutinins with these fractions we believe to be a new demonstration.

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**The effect of saline purgatives on the absorption of other drugs.**

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It is well known that the pharmacodynamics of saline purgatives consists chiefly in the poor absorbability of certain ions such as those of magnesium, sulphate, phosphate, etc., and the accumulation of fluid in the intestinal canal through the osmotic action of the unabsorbed salt which, instead of being absorbed, actually draws fluid into the intestinal lumen. This peculiar

<sup>1</sup> Langer, *Verhandl. d. Gesellsch. f. Kinderheilk.*, 1907, xxiv, 70.

phenomenon led the author to inquire into what effect the administration of such purgatives may have upon the absorption of other drugs given by mouth simultaneously or a little after the laxative. Accordingly experiments were first made with phenolsulphonphthalein. This drug, as is well known, is rapidly absorbed, whether given by injection or by the stomach, and is equally as rapidly excreted by the kidneys. Several dogs were given a given quantity of a solution of phenolsulphonphthalein by stomach tube and the amount excreted in the urine at the end of one and two hours was determined quantitatively by the colorimetric method. Several days later after the drug had been completely excreted, the same amount of dye with the same amount of fluid was administered to the same animals by the same method, with the exception that the dye was this time mixed with a solution of sodium sulphate (5 per cent.) instead of plain water. The excretion of the dye by the kidneys was studied at the end of each hour as in the first series of experiments. It was found that the excretion of the phenolsulphonphthalein was markedly delayed by the simultaneous or previous administration of sodium sulphate. The same was true of magnesium sulphate and other saline purgatives, but no such effect was produced by the administration of other cathartics of a non-saline character such as castor oil or cascara sagrada.

To study the mechanism of the above phenomenon more in detail, experiments were then made on cats. The animals were anesthetized, laparotomy was performed and two loops of intestine of exactly the same length were tied off, in some experiments in the same animal, and in other experiments in two separate animals. Into one loop 1 c.c. of standard phenolsulphonphthalein solution mixed with a given volume of water was injected. Into the other loop exactly the same amount of dye was mixed with exactly the same volume of sodium-sulphate solution. The intestines were replaced in the abdominal cavity and the abdomen closed. At the end of an hour the animals were killed and each loop of the intestine was cut out and its contents carefully measured. It was found that in the control loops, that is, the loops containing a solution of the dye in water, much of the fluid was absorbed and the amount of dye remaining in the contents of that

loop plus any dye that could be rinsed out of the intestinal mucosa examined colorimetrically indicated a marked absorption (in some cases as high as 60 or more per cent.) at the end of an hour. When the contents of the loops containing the dye with the saline solution were examined it was noted at once that the volume of fluid in the loop was greatly increased due to osmotic drawing of fluid into the lumen. A quantitative determination of the dye content in these loops showed that over 90 per cent. of the dye had been unabsorbed at the end of an hour. On dipping the mucosa of each loop in weak alkali a striking picture was obtained. Whereas the normal or control loops became intensely red indicating the passage of dye into the villi and the circulation, the appearance of the other loop (the "saline loop") was very pale and showed very little red color, thus indicating the very poor absorption of the dye.

Following the above experiments with phenolsulphonphthalein, an extensive investigation was undertaken on the effects of saline purgatives on the absorption of a large number of drugs. Details will be published in the full paper. In this place suffice it to say that representatives of various classes of drugs were tested. Among these may be mentioned digitalis, various antipyretics such as salicylates, acetanilid, and antipyrine, etc., a number of salts such as urotropin, iodides, etc., a number of opiates, various alkaloids, bichloride of mercury and other substances. It was found that almost every kind of drug that was examined was delayed more or less in its absorption by the previous and even by the simultaneous administration of sodium sulphate, magnesium sulphate and other saline laxatives. These effects were determined in some cases by physiological tests and in other cases by chemical examination. In case of non-toxic drugs the observations were corroborated by tests on human volunteers. The studies on the influence of saline purgatives on the phenolsulphonphthalein kidney function test are to appear in a forthcoming number of the *Journal of Urology*. A study of other classes of drugs in this respect will appear in the Bulletin of the Johns Hopkins Hospital.