

Reaction of Rat Mother to Retention of Near Term Dead Fetuses.

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Corey¹ reported that death of the mother almost invariably took place in cases which involved retention of older (larger) dead rat fetuses. He stated that, "Near-term fetuses which have been either separated from the maternal blood supply in the uterus or placed in the maternal peritoneal cavity bring about the early death of the mother." Death occurred in his cases from 1-3 days after the operation. The present work does not confirm these findings.

Albino rat females were caused to retain varying numbers of near term dead fetuses, both *in utero* and in the body cavity. The uteri were exposed through a medial ventral abdominal incision to allow easy access to both horns of the uterus. The fetuses nearest the Fallopian tube were killed through an incision in the uterine wall, at the periphery of the placenta, just large enough to insert a needle. The end of the needle was bent to form a complete loop in order not to injure the tissue unnecessarily. It was possible to free the entire placenta by rotating such a needle between the placenta and uterine wall. This procedure carefully done does not injure the embryo or embryonic membranes. Abortion of the killed fetuses was prevented by ligation of the uterus. Sterile precautions were always employed.

Two fetuses measuring 19 mm. (c-r) were killed. The remaining young, but one, were not disturbed during the operation. The one was removed as a control. Four days after the operation a litter of 6 healthy young were born. These were nursed by the mother and given excellent care. Apparently the 2 retained dead fetuses produced no disturbance in the general behavior of the mother.

In another case 3 fetuses of 28 mm. (c-r) were killed and left in one horn of the uterus; the other uterine horn not being disturbed. Two days after the operation this female had a litter of 4 living young. These were all eaten by the mother in the next 2 or 3 days. Failing to eat regularly thereafter, the mother was forcibly fed for about 10 days, starting on the 9th day after the operation. At the end of this time she began to eat more regu-

¹ Corey, E. L., *Anat. Rec.*, 1933, **56**, 196.

larly although not as well as a normal rat. She thrived fairly well under the same general treatment received by the rest of the rat colony. On the 35th day after the operation a reddish eminence on her side was noticed defining an area where the fetal material had caused an ulceration in the abdominal wall. The animal was sacrificed the next day. Autopsy revealed partially macerated fetuses impacted against the body wall in the region located externally by the presence of the discolored evagination.

In still another experiment 8 dead fetuses measuring 30-31 mm. were retained *in utero*. The female failed to eat well so forced feeding was started on the 6th day after operation. This was continued until the mother died 17 days after operation. Nothing particularly abnormal was noted in her general reaction except for anorexia. Her general condition seemed to improve from the 13th to the 16th day and consequently death on the 17th day after operation was unexpected. Autopsy revealed the bulk of the dead fetuses to be so great as to extend up under the liver, nearly to the diaphragm. The intestines were considerably disarranged, and gangrenous in one area with extensive adhesions. It is believed that death of this female was caused by intestinal obstruction with a resultant gangrene. Examination of the retained material showed considerable maceration to have occurred, not only of the fetuses but of the membranes and placenta as well.

There appears to be some evidence in the literature that necrosing dead fetuses produce greater toxic effect on the mother if retained in the peritoneal cavity rather than *in utero*. Corey¹ reports that dead fetuses *in utero* produce practically no change in the maternal total leucocyte number but if retained in the body cavity a definite leucocytosis results. He further states, "The uterus may thus be said to act in a protective manner against the necrosing fetal tissue in its lumen." From this one might assume that if unenveloped fetuses were placed in the peritoneal cavity the maternal reaction to the presence of these dead fetuses would be greater than when left *in utero*, and therefore, death of the mother resulting from retention of such near term dead fetuses should be more rapid.

As a test of the above statements 2 fetuses measuring 30-32 mm. (c-r) were placed in the peritoneal cavity with placenta and membranes. The embryonic membranes were almost completely removed from the fetuses. Litter mates were removed at time of operation. A rapid and complete recovery from the operation took place and the female appeared normal. At the end of 28 days she was sacrificed and autopsied. The body outline of these fetuses

showed less distortion and apparently less maceration had occurred than in comparable cases of retention *in utero*. These fetuses felt quite firm in contrast to the soft yielding fetal mass generally found when fetuses of this size were retained *in utero*. The placentæ were firm and appeared quite shrunken.

In another experiment of the same nature 6 fetuses measuring 32 mm. were placed in the body cavity. The embryonic membranes were torn and folded off these fetuses but in each case were placed in the body cavity with the placentæ. This female seemed healthy and normal; eating well and appearing quite lively. The retained dead fetuses had no apparent effect upon the mother. She was sacrificed and autopsied after 21 days. The appearance of the fetuses and their placentæ was similar to that of those just described.

It appears from the above that retention of near term dead fetuses *in utero* or in the peritoneal cavity does not necessarily result in death of the mother.

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Gasometric Determination of Carboxyl Groups in Amino Acids.

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Ruhemann¹ and Grassmann and von Arnim² have shown that the color-forming reaction of ninhydrin with amino acids occurs with evolution of CO₂. We have found that at pH 5, or somewhat lower, in water solution the CO₂ from carboxyl groups adjacent to alpha-amino groups can be quantitatively split off in 3 minutes. The apparatus used is that employed by Van Slyke, Page and Kirk³ for manometric determination of organic carbon. In the combustion tube of this apparatus are placed a few milligrams of amino acid, 100 mg. of KH₂PO₄, and 50 mg. of ninhydrin made to a volume of 1.0 cc. with water. The tube is connected to the manometric chamber, arranged as for combustions,³ and the solution is boiled gently for 3 minutes. The evolved CO₂ is measured as in carbon combustions.³ The reaction appears to be specific for car-

¹ Ruhemann, S., *J. Chem. Soc.*, 1911, **99**, 792, 1486.

² Grassmann, W., and von Arnim, K., *Annalen der Chem.*, 1934, **510**, 288.

³ Van Slyke, D. D., Page, I. H., and Kirk, E., *J. Biol. Chem.*, 1933, **102**, 635.