TRANSMISSION OF RESPIRATORY ANAPHYLAXIS
(ASTHMA) FROM MOTHER TO OFFSPRING.*

By BRET RATNER, M.D., AND HELEN LEE GRUEHL.

(From the Departments of Immunology and Pediatrics, University and Bellevue Hospital Medical College, New York University, New York.)

(Received for publication, January 16, 1929.)

In the past it has been thought that nasal sensitization could be brought about only through the insufflation of solutions. Through work recently reported we have proved that nasal sensitization can be induced by the inhalation of a dry substance (horse dander). We have demonstrated\(^1\) that when guinea pigs are subjected to an organic dust-laden atmosphere, they become sensitized, after a certain incubation period, to the substance which they have inhaled. We have termed this type of hypersensitiveness "respiratory anaphylaxis."

In a further series of studies\(^2\) it was shown that a guinea pig sensitized by parenteral injection prior to or during pregnancy will sensitize her offspring in utero—passively or actively—and that this mechanism is traceable to the permeability of the placenta.

It has now become of interest to determine whether a pregnant animal made sensitive by inhalation, can transmit sensitizing substances to her fetus in utero.

EXPERIMENTS.

For these experiments, mature female guinea pigs were kept in our animal house for a number of weeks. In no instance was any evidence


TRANSMISSION OF RESPIRATORY ANAPHYLAXIS

of dyspnea observed. After this period of observation, the animals were placed in cages with normal males for mating and then exposed to horse dander dust—in a manner previously described—during various periods of time. In certain instances conception occurred prior to the period of sensitization. Hence it came about that we had mothers which had been sensitized to horse dander dust either before or during pregnancy. After varying intervals of time, these pregnant animals were again placed in contact with horse dander dust and in the majority of instances they manifested definite respiratory anaphylaxis (asthma).

Soon after birth, the offspring of these mothers were brought into contact with horse dander dust and their reactions on first contact with this substance noted. 1 hour later both the mothers and their offspring were given an intravenous injection of an alkaline extract of this horse dander, in order to test whether such respiratory disturbances as had been observed were anaphylactic in nature. The details of our experiments are given in the following protocols.

PROTOCOLS.

Family 1.

Female 1030 (510 gm.) was placed in the inhalation chamber and exposed to the horse dander dust for a total of 9 hours between Nov. 21, 1927 and Dec. 1, 1927; in no instance was there any evidence of dyspnea. On Feb. 16, 1928, 2½ months later, she was placed in the inhalation chamber and showed severe convulsions and marked dyspnea—definite respiratory anaphylaxis. At varying intervals of time she was again brought into contact with this dust and exhibited definite symptoms of respiratory anaphylaxis. On May 10, 1928 she gave birth to 2 offspring.

Offspring 1454, 1455 (90, 100 gm.), when 5 days old, on May 15, 1928, each received an intravenous injection of 0.5 cc. dander extract and both died in typical anaphylactic shock.

Mother on the same day was given 0.5 cc. dander extract intravenously and also died in typical anaphylactic shock with lungs typically ballooned.


Family 2.

Female 1311 (640 gm.) was sensitized by exposure to horse dander dust for 8 hours from Jan. 20, 1928 to Jan. 28, 1928. On Feb. 13, 1928, 24 days after her initial exposure, she gave birth to 1 pig.

Offspring 1344 when 4 days old was placed in the inhalation chamber and showed definite evidences of moderate respiratory anaphylaxis.

Mother.—This guinea pig again became pregnant shortly after the previous confinement and at varying intervals, on being placed in the inhalation chamber, showed evidences of marked respiratory anaphylaxis. The second litter of 3 offspring was born on July 11, 1928.

Offspring—second litter—1516, 1517, 1518 (65, 70, 85 gm.) were placed in the inhalation chamber when 1 day old and all had marked respiratory anaphylaxis. This respiratory anaphylaxis was much more severe than that exhibited by the offspring of the first confinement. On the same day each received an intravenous injection of 0.3 cc. dander extract and all died in typical anaphylactic shock.

Mother (795 gm.) on the same day manifested marked respiratory anaphylaxis when placed in the inhalation chamber and on intravenous injection of 0.5 cc. dander extract showed profound anaphylaxis, dyspnea and collapse with final recovery.

Families 4 and 5 gave similar results.

Family 3.

Female 1509 (745 gm.) was exposed to horse dander dust for 6 hours in all from May 31, 1928 to June 6, 1928 and showed no signs of dyspnea during the exposures. 3 weeks after the initial exposure, on June 20, 1928, she was again placed in the inhalation chamber and showed marked respiratory anaphylaxis. This respiratory anaphylaxis was manifested at another contact with horse dander. On July 26, 1928, a little less than 2 months after the initial sensitizing exposure, the animal gave birth to 2 offspring.

Offspring 1594 and 1595 (80 gm. each) when 1 day old were placed in the inhalation chamber and manifested marked symptoms of respiratory anaphylaxis. On the same day each received 0.3 cc. dander extract intravenously following which both died in typical anaphylactic shock.

Mother on the same day, when placed in the inhalation chamber, exhibited moderate respiratory anaphylaxis and on intravenous injection of 0.5 cc. dander extract showed unmistakable signs of anaphylaxis—collapse, dyspnea, suffusion of the eyes, with final recovery.

Families 4 and 5 gave similar results.

Family 6.

Female 1217 (550 gm.) was sensitized in the inhalation chamber for 9 hours from Nov. 21, 1927 to Dec. 1, 1927 with no evidences of dyspnea. When again placed in the inhalation chamber on Feb. 16, 1928 she showed marked respiratory
anaphylaxis. This respiratory anaphylaxis was repeated at various intervals whenever the animal was placed in the inhalation chamber. On Sept. 3, 1928 she gave birth to 2 offspring.

Offspring 1626, 1627 (125, 120 gm.) when 10 days old, on Sept. 13, 1928, were placed in the inhalation chamber for the first time and showed marked evidences of respiratory anaphylaxis. Offspring 1626 gave a very profound reaction. It recovered, however, and after an intravenous injection of 0.3 cc. dander extract it showed only marked anaphylaxis with recovery. On the other hand Offspring 1627, which was not so profoundly affected in the inhalation chamber, died in acute anaphylactic shock after an intravenous injection of 0.3 cc. dander extract.

Mother on the same day showed moderate respiratory anaphylaxis in the inhalation chamber and after an intravenous injection of 0.5 cc. dander extract exhibited definite anaphylaxis with recovery.

Family 7.

Female 1466 (740 gm.) was sensitized in the inhalation chamber for 3½ hours from May 24, 1928 to May 29, 1928 and showed no dyspnea at all. When again placed in the inhalation chamber on June 13, 1928, 3 weeks after the initial exposure, she had no evident reaction. On June 28, 1928, she gave birth to 2 offspring.

Offspring 1512, 1513 (60, 65 gm.) when 12 hours old were placed in the inhalation chamber and showed profound respiratory anaphylaxis. Intravenous injection of 0.3 cc. dander extract produced death in Offspring 1512 and marked anaphylaxis—convulsions, collapse, dyspnea—with recovery in Offspring 1513.

Mother. It is interesting that the mother when placed in the inhalation chamber on the same day was still negative and showed only slight symptoms of anaphylaxis after an intravenous injection of 0.5 cc. dander extract.

Family 8.

Female 1467 (610 gm.) was placed in the inhalation chamber for 3½ hours from May 24, 1928 to May 29, 1928 and showed no signs of respiratory anaphylaxis. On June 13, 1928, after an incubation period of 3 weeks, when again placed in the inhalation chamber, she was negative. 2 weeks after this, however, when placed in the inhalation chamber she demonstrated marked respiratory anaphylaxis. On July 21, 1928, a little less than 2 months after the beginning of sensitization, she gave birth to 3 offspring.

Offspring 1583, 1584, 1585 (50, 85, 75 gm.) when 3 days old, on July 24, 1928 showed moderate dyspnea when placed in the inhalation chamber and moderate signs of anaphylaxis after an intravenous injection of 0.3 cc. dander extract.

Mother on the same day in the inhalation chamber and after an intravenous injection of 0.7 cc. dander extract, showed the same moderate symptoms as did the offspring.

Families 9, 10, 11 and 12 gave similar results.
Family 13.

Female 1460 (700 gm.) was exposed to dander in the inhalation chamber for ½ hour on May 23, 1928 and ½ hour on May 24, 1928 and showed no dyspnea. This animal gave birth to 2 offspring on May 25, 1928, the 2nd day after the initial exposure.

Offspring 1482, 1483 (215, 210 gm.) when 27 days old, on June 21, 1928, were both put in the inhalation chamber. Offspring 1482 showed marked respiratory anaphylaxis and after intravenous injection of 0.5 cc. dander extract died in typical anaphylactic shock. Offspring 1483 was practically negative in the cage but after an intravenous injection of 0.5 cc. dander extract manifested moderate anaphylaxis with recovery.

Mother on the same day—28 days after her initial exposure to dander—was placed in the inhalation chamber and was negative. On the same day she showed definite anaphylaxis with recovery after an intravenous injection of 0.5 cc. dander extract.

Family 14.

Female 1265 (400 gm.) was exposed to dander in the inhalation chamber for 11 hours from Dec. 22, 1927 to Jan. 13, 1928 with no signs of dyspnea. On Jan. 16, 1928, 25 days after the initial exposure to dander, she gave birth to 2 offspring.

Offspring 1308, 1309 (190, 150 gm.) on Feb. 7, 1928, when 22 days old, were not placed in the inhalation chamber but were each given an intravenous injection of 0.5 cc. dander extract. Offspring 1308 was practically negative and Offspring 1309 showed only suffusion of the eyes.

Mother on the same day, however, when given an intravenous injection of 0.5 cc. dander extract had convulsions, collapse, marked dyspnea and died in typical anaphylactic shock after collapse for about ½ hour.

Family 15.

Female 1173 (540 gm.) was exposed to dander in the inhalation chamber for 10 hours from Nov. 7, 1927 to Nov. 19, 1927 with no signs of dyspnea. On Feb. 16, 1928, 3½ months after the initial exposure, when again placed in the inhalation chamber, this animal showed definite respiratory anaphylaxis. She was placed in the inhalation chamber at 2-week intervals throughout her pregnancy and each time exhibited marked respiratory anaphylaxis. On July 13, 1928 this animal gave birth to 1 offspring.

Offspring 1541 (130 gm.) on July 19, 1928, when 6 days old, showed moderate dyspnea in the inhalation chamber and after intravenous injection of 0.3 cc. dander extract had marked anaphylaxis with collapse and final recovery.

Mother on the same day was negative in the inhalation chamber and also after intravenous injection of 0.5 cc. dander extract.
Family 16.

Female 1461 (580 gm.) was exposed to dander in the inhalation chamber for 4 hours from May 23, 1928 to May 29, 1928, with no evidence of dyspnea. On June 8, 1928, 16 days after the initial contact with dander, she gave birth to 3 offspring.

Offspring 1493, 1494, 1495 (120, 130, 130 gm.) when 13 days old, on June 21, 1928, were placed in the inhalation chamber for the first time and were negative. Each animal received an intravenous injection of 0.5 cc. dander extract on the same day; Offspring 1493 was negative, Offspring 1494 and 1495 each showed moderate anaphylaxis with recovery.

Mother on the same day was placed in the inhalation chamber and had typical respiratory anaphylaxis. After an intravenous injection of 0.5 cc. dander extract she showed typical anaphylaxis with recovery.

Family 17.

Female 1408 (840 gm.) was exposed to dry horse dander for 6 hours from Mar. 15, 1928 to Mar. 21, 1928 and showed no signs of dyspnea. This sensitization was prior to pregnancy. This animal was placed in the inhalation chamber at 2-week intervals and was negative until about 1½ months before confinement when she began to develop symptoms of moderate respiratory anaphylaxis. On July 30, 1928, 4 offspring were born.

Offspring 1596, 1597, 1598, 1599 (80, 60, 75, 70 gm.) when 1 day old, on July 31, 1928, were placed in the inhalation chamber and all showed only suggestive symptoms of respiratory anaphylaxis. On intravenous injection of 0.3 cc. dander extract each again showed only suggestive symptoms.

Mother on the same day when placed in the inhalation chamber and also after intravenous injection of 0.5 cc. dander extract demonstrated only suggestive symptoms.

Family 18.

Female 1463 (600 gm.) was placed in the inhalation chamber for 3½ hours from May 24, 1928 to May 29, 1928 with no symptoms of dyspnea. On June 18, 1928, 25 days after the initial exposure, when again placed in the inhalation chamber she showed signs of moderate dyspnea but when subsequently placed in the inhalation chamber at various intervals, there were no signs of dyspnea. On July 24, 1928, 2 months after the beginning of sensitization, 3 offspring were born.

Offspring 1586, 1587, 1588 (75, 70, 75 gm.) were placed in the inhalation chamber when 2 days old, on July 26, 1928, and gave a slight to negative reaction. On the same day an intravenous injection of 0.3 cc. dander extract brought forth no anaphylactic reaction.

Mother on the same day showed no symptoms of anaphylaxis after exposure to dander and none after intravenous injection of 0.6 cc. dander extract.
Family 19.

*Female* 1469 (520 gm.) was placed in the inhalation chamber for 3½ hours from May 24, 1928 to May 29, 1928 and showed no dyspnea. On June 7, 1928 she gave birth to 2 offspring.

*Offspring* 1491, 1492 (55, 35 gm.) were placed in the inhalation chamber when 1 day old, on June 8, 1928, and were both negative. They showed no signs of anaphylaxis after an intravenous injection of 0.3 cc. dander extract.

*Mother* was negative when placed in the inhalation chamber on the same day and also after an intravenous injection of 1 cc. dander extract.

Families 20, 21 and 22 gave similar results.

Family 23.

*Female* 1473 (510 gm.) was placed in the inhalation chamber for 6 hours from May 31, 1928 to June 6, 1928 with no signs of dyspnea. On June 20, 1928, 20 days after the initial contact, she was again placed in the inhalation chamber and was negative. On June 23, 1928, 2 offspring were born.

*Offspring* 1494, 1495 (60, 55 gm.) were placed in the inhalation chamber on June 26, 1928, when 3 days old, and were negative. They were also negative after an intravenous injection of 0.5 cc. dander extract.

*Mother* on the same day was negative in the inhalation chamber and after intravenous injection of 0.5 cc. dander extract.

Families 24, 25 and 26 gave similar results.

**Analysis of Protocols.**

As controls for these experiments we had 11 new-born animals which manifested no signs of dyspnea when exposed to dander in the inhalation chamber. These animals were injected intravenously with horse dander solution and manifested no reaction after the injection. This indicates that only specifically sensitized new-born animals will evidence anaphylactic symptoms. The adult guinea pigs have been shown to be non-sensitive because none of them manifested any signs of dyspnea during the period of sensitization.

In Family 1 we have an animal sensitized by inhalation of dry horse dander before pregnancy which, at various times throughout her pregnancy, was brought into contact with this dust and manifested severe respiratory anaphylaxis (asthma). When her offspring were 5 days old and were given an intravenous injection of dander extract, they died in acute anaphylactic shock. These 2 offspring demonstrate that an animal sensitized merely by inhalation and which has had
### Summary of Protocols.

<table>
<thead>
<tr>
<th>Family</th>
<th>Mother Respiratory anaphylaxis before birth of offspring</th>
<th>Offspring No.</th>
<th>Respiratory anaphylaxis</th>
<th>Intravenous injection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1030 ++ Not done ++</td>
<td>1454 Not done</td>
<td>Not done ++</td>
<td>++</td>
</tr>
<tr>
<td>2</td>
<td>1311 Not done ++ ++ Not done</td>
<td>1344 ++</td>
<td>Not done +</td>
<td>++</td>
</tr>
<tr>
<td>3</td>
<td>1509 ++ + ++</td>
<td>1594 ++</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>4</td>
<td>1476 ++ - ++</td>
<td>1606 ++</td>
<td>Not done +</td>
<td>++</td>
</tr>
<tr>
<td>5</td>
<td>1410 ++ + ++</td>
<td>1489 ++</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>6</td>
<td>1217 ++ + ++</td>
<td>1626 ++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>7</td>
<td>1466 - - + -</td>
<td>1512 ++</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>8</td>
<td>1467 ++ + +</td>
<td>1583 +</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9</td>
<td>1215 ++ ++ ++</td>
<td>1580 ++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>10</td>
<td>1481 ++ + +</td>
<td>1631 +</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>11</td>
<td>1480 ++ - +</td>
<td>1623 +</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>12</td>
<td>1479 Not done + ++</td>
<td>1496 +</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

---

- No reaction.
- + - Slight symptoms of anaphylaxis.
- + Moderate symptoms of anaphylaxis.
- ++ Marked symptoms of anaphylaxis.
- +++ Typical anaphylactic death with distended lungs.
<table>
<thead>
<tr>
<th>Family</th>
<th>Mother</th>
<th>Offspring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Respiratory anaphylaxis before birth of offspring</td>
<td>Respiratory anaphylaxis after birth of offspring</td>
</tr>
<tr>
<td>13</td>
<td>Not done</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>++</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>Not done</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>Not done</td>
</tr>
</tbody>
</table>
respiratory anaphylaxis during pregnancy can give birth to offspring which are sensitive to the same substance.

Families 2, 3, 4 and 5 demonstrate the transmission of respiratory anaphylaxis from mother to offspring, that is, the offspring, when exposed to horse dander for the first time gave evidence of respiratory anaphylaxis.

Families 6, 7, 13 and 16 also demonstrate the transmission of respiratory anaphylaxis from a mother to her offspring but show in all instances a varying degree of sensitization in the offspring. In 3 families 1 offspring died in anaphylactic shock while the other offspring showed anaphylaxis with recovery. In Family 16, 1 offspring was entirely negative while the other 2 showed moderate anaphylaxis. In this last case the mother was strongly anaphylactic.

In Families 8, 9, 10, 11 and 12 we have instances of respiratory anaphylaxis to a more moderate degree in both mother and offspring than has been evidenced in the above families.

Family 13 demonstrates active sensitization of a fetus in utero. The mother was exposed to the horse dander dust for 1 hour only. 2 days after her initial contact she gave birth to 2 offspring. These offspring were permitted to live in a normal environment for 27 days and were then exposed to dander in the inhalation chamber for the first time. They showed marked respiratory anaphylaxis (asthma) in the inhalation chamber and 1 died when given an intravenous injection of dander extract. Here we have an instance of the transfer not of antibodies from a mother which has suffered from respiratory anaphylaxis during pregnancy, but the passage of antigen through the upper respiratory tract into the mother’s circulation and thence into the circulation of the fetus. In the fetal blood this antigen brings about the development of active sensitization after a suitable incubation period has elapsed.

In Families 14 and 16 we have instances in which the mother was profoundly sensitive and the offspring were only moderately sensitive. The only symptoms of anaphylaxis shown in Family 14 was that of suffusion of both eyes of 1 offspring. The symptoms of suffusion were also shown by Animals 1509 and 1479.

Families 7 and 15 show interesting instances of the sensitization apparently having worn off in the mother whereas there is still a moderate anaphylactic sensitization present in the offspring.

In Families 17 and 18 we have only an extremely moderate degree of respiratory anaphylaxis in the mother and in the offspring. In Family 17 where the sensitization was carried on over a long period of time the transmission of respiratory anaphylaxis was no more marked than in Family 18.

In Families 19, 20, 21 and 22 there has been an absence of transmission of respiratory anaphylaxis probably because of the short period of exposure of the mother. In these cases the mothers themselves were not sensitive.

In Families 23, 24, 25 and 26, on the other hand, we have instances of a sufficiently long period of sensitization in the mother with neither the mothers nor the offspring showing any sensitization.

In Family 2 we have an instance of two litters born to the same animal. In the case of the first litter the time between the beginning of sensitization and confinement of the mother was only 23 days and the offspring showed only moderate anaphylaxis. In that of the second litter, born after the mother had had many attacks of respiratory anaphylaxis (asthma), throughout her pregnancy, the offspring were profoundly sensitive and all died after an intravenous injection of dander extract.

DISCUSSION.

Normal guinea pigs, whether they be pregnant mothers or offspring only a few days old, will not manifest dyspnea when exposed to a dust to which they are not sensitive. This has been demonstrated by our many experiments.

In order to prove the anaphylactic character of the symptoms and to rule out pneumonia or any other pathologic condition of the guinea pig which might simulate the dyspnea found in respiratory anaphylaxis, the animals received an intravenous injection of an extract of the dust on the same day that they demonstrated this syndrome and in all cases necropsies were performed.

It may be of interest to comment on the fact that in 26 families studied we have no single instance of miscarriage during the attacks of respiratory anaphylaxis (asthma) even in the latter period of pregnancy.

Analysis of our protocols demonstrates that a mother guinea pig which has manifested respiratory anaphylaxis during pregnancy may passively transmit the state of hypersensitivity to her offspring in utero. In one instance this was brought about by an active sensitization in utero. When the offspring are first brought into contact with a dust to which the mother is sensitive, they exhibit respiratory anaphylaxis (asthma) of the same sort she showed.

There were certain variations in the transmission which call for further discussion.

Because of the nature of the experiments, it has been impossible to sensitize and expose these mothers in a uniform manner. For this reason—as is evident in Table I—instances occurred in which sensitization was firmly established in the mothers and was transmitted, other instances in which the mothers were more profoundly sensitized than the offspring or conversely in which the offspring had a higher degree of sensitization than the mother; instances in which the sensitization established was of a moderate grade; and finally instances in which there was no sensitization of either mother or offspring. Several of the families in this last group undoubtedly had too short a period of exposure for the establishment of sensitization, while others, although the period was long enough apparently, were not sensitized.

In Family 2 we have an interesting example of the influence of the period upon the results. The offspring of the first litter was only moderately sensitive whereas those of the second litter, after the mother had shown profound respiratory anaphylaxis throughout her pregnancy, were sensitive and died in typical anaphylactic shock.

We were fortunate in having 1 family in which the mother was exposed for only 2 days before confinement. The offspring in this instance could not have received sensitizing antibodies but must have developed an active sensitization from antigen transmitted in utero. This mechanism has been demonstrated by us in a previous study.

In our previous work\textsuperscript{9} it was shown that guinea pigs injected prior to or during pregnancy might give birth to sensitive offspring; and in another study\textsuperscript{10} we presented instances of human mothers eating excessively of certain foods during pregnancy who gave birth to children sensitive to those foods.

We believe the experiments presented in this paper demonstrate a manner in which the human offspring of an asthmatic mother might be sensitized. Furthermore, the experiments indicate that mothers with the asthma of anaphylaxis may not always give birth to asthmatic children and on the other hand that mothers, themselves not asthmatic, may transmit sensitizing antigen to their offspring.

CONCLUSIONS.

1. A further method is offered whereby sensitization in utero may be established.
2. Respiratory anaphylaxis—induced in a pregnant guinea pig by the inhalation of a dry antigenic dust—can thus be transmitted from mother to offspring.
3. A guinea pig thus sensitized in utero, when brought into contact for the first time with an anaphylactogenic dust to which the mother was sensitized, will manifest respiratory anaphylaxis.
4. The transmission of this hypersensitiveness may be brought about passively through the transmission of sensitizing antibodies.
5. A fetus may be actively sensitized in utero by a mother which has inhaled the antigenic dust and has not herself been sensitive at the time of birth.
6. This state of hypersensitiveness may be transmitted in varying degrees of intensity and when 2 or more offspring are born in the same litter, they may, in some instances, be sensitized to an equal degree and sometimes to different degrees.
7. This state of hypersensitiveness can be transmitted through more than 1 litter.
8. All animals cannot be made hypersensitive.


\textsuperscript{10} Ratner, B., \textit{Am. J. Dis. Child.}, 1928, xxxvi, 277.