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# STUDIES ON THE TUBAL PATENCY OF THE COW

## II. TUBOINSUFFLATION TEST IN CLINICAL CASES

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### INTRODUCTION

In a previous paper<sup>9)</sup>, it was reported that, in the cow, cases of tubal patency disturbances were found more frequently when examined by the hydrotubation test than when diagnosed on basis of the histopathological findings.

It now seems very interesting to make a study on how these tubal disturbances can be more frequently detected clinically in the living animals. WILLIAMS<sup>14)</sup> reported that rectal examination of the oviduct and the ovarian bursa was very valuable for this purpose. ROBERTS stated that palpation of the oviduct per rectum required experience and care, and that the diagnosis of pathological changes in the oviduct and ovarian bursa was difficult, especially if the lesions were rather mild.

On the other hand, attempts were made by WILLIAMS<sup>15)</sup>, FOSSUM, HETZEL, HANLY, TAKAMINE, and others to introduce Rubin's insufflation test used widely in humans into the diagnosis of patency of the bovine oviduct, using oxygen, carbonic acid gas or air for insufflation. Some of these investigators considered Rubin's test to be impracticable in the cow, because of its expensiveness, or lack of facilities at the disposal of veterinarians, while the others considered it to be practicable for diagnosis of patency. The present authors have also made investigations on this subject since several years ago, and have preliminarily reported<sup>8)</sup> the possibility of applying the test practically to the cow.

This paper deals with the results of the tuboinsufflation test as practised in 60 infertile cows. The technique used will also be outlined.

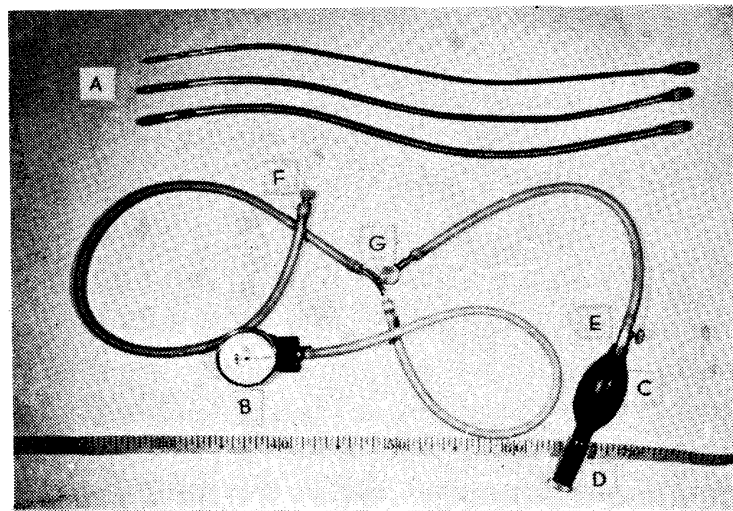
### MATERIALS AND METHODS

#### 1. Materials

Fifty-seven Holstein-Friesian cows, 2 heifers of the same breed and 1 Guernsey cow

were used in this experiment. Ranging from 2 to 16 years in age and from 0 to 11 times in calving, they were all suffering from low fertility. In some of the cases, endometritis or slight catarrhal changes were found in the uterus by uterine biopsy, while in most of them no anomalies were detected in the uterus, oviducts and ovaries either clinically or by biopsy. They had been inseminated several times in vain; 42 of them were even sterile for as long a period as 10 to 30 months after the last calving or abortion.

FIGURE 1. *Tuboinsufflation Test Apparatus*



Scale: cm

Notes: A : Metal catheters      E : Stopcock  
 B : Manometer                F : Adapter  
 C : Rubber bulb                G : Three-way valve  
 D : Filter

## 2. Apparatus

A new special apparatus, as shown in fig. 1, devised by the authors was used. This apparatus is composed of the following parts: three metal catheters of different diameters (A) which serves for air insufflation into the uterine cavity, a manometer (B), a rubber bulb for sending air (C), a filter for removing air dust (D), a stopcock (E), an adapter (F), a three-way valve (G) and three pieces of hard rubber tube for connecting the respective parts.

## 3. Principle of the test

When the fallopian tubes are normal, the air insufflated into the uterus comes out from the tubal abdominal ends, passing through the tubal cavity. Therefore, if one holds in his hand, per rectum and near the abdominal os, the end portion of either side of the tubes, the air coming out through the tube can easily be felt as a peculiar fremitus-like sensation to the touch, the manometer showing at the same time a gradual fall of the air-pressure once elevated by pressing the bulb.

#### 4. Technique of the tuboinsufflation test

A vaginal speculum, one set of cervical dilators, a pair of cervical forceps and some antiseptic solutions must be prepared for the operation, together with the apparatus above described. First, one of the metal catheters fit for the width of the cervical canal of the animal to be examined, is introduced firmly into the uterine cavity, by about 10cm of the catheter, with great care not to injure or rupture mechanically the organs, just like in the procedure of uterine irrigation. The operator keeps the manometer in his left hand, inserts his right hand into the rectum and holds the ovary together with the fimbria ovarica of the side to be examined. The assistant holds the rubber bulb in his left hand grasps the cervix firmly per vaginum with his right hand, thus fixing in place the metal catheter introduced into the uterus, in order to prevent the air introduced from flowing back. Then, the assistant presses the bulb gently and carefully, watching the manometer, and stops sending air before the pressure reaches 150 mmHg. Decrease of the pressure is measured. The opposite oviduct is examined in the same manner.

#### RESULTS AND CONSIDERATIONS

The tuboinsufflation test was practiced 67 times in 60 animals. Tubal patency types classified on the basis of the test are grouped as follows:

(1) Passable type, in which patency is good, passage of air being continuous. In this type, the pressure falls gradually after insufflation till about 60~80 mmHg.

(2) Relatively passable type, in which the passage of air is intermittent, the pressure standing still at 120 mmHg or so. In bilateral bad patency cases, the decrease of the pressure is very slow.

(3) Impassable type, in which passage of air is not at all palpated. In bilateral impassable cases, the pressure stands still after insufflation of air, showing no decrease.

(4) Perplexing type, in which the pressure once elevated falls suddenly to zero, showing thereafter no increase in spite of continuous insufflation. This indicates the penetration of air into the uterine mucosa. In such cases, the emphysema is easily palpated per rectum along the uterine wall or the broad ligament.

The relation between changes in pressure in these various types and the time before and after insufflation is schematically graphed in figure 2.

The results of this experiment are summarized in the table. Bilateral passable cases were only 9 (13.4%), while unilateral passable cases were 16 (24.0%), numbering in total 25 (37.4%). On the other hand, bilateral impassable cases were 30 (44.8%). One may gain the impression from these results that the oviducts are really obstructed in numerous cases. However, it is doubtful whether in all these impassable oviducts the impassability detected by the tuboinsufflation test reflects directly true occlusion, because in some animals which were diagnosed

FIGURE 2. *Relation Between Changes in Pressure and Time Before and After Stopping of Insufflation*

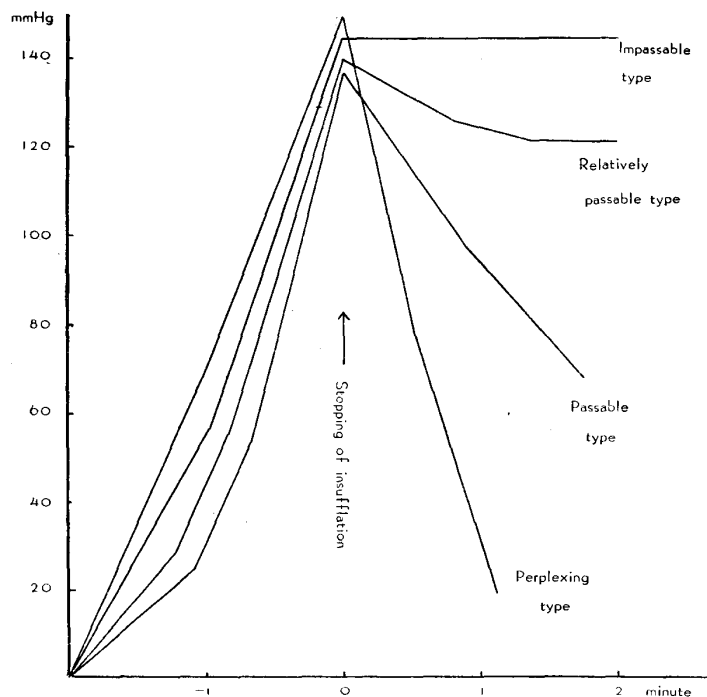


TABLE *Results of the Tuboinsufflation Test*

PASSABILITY OF OVIDUCTS	NO. OF CASES (%)
Bilateral passable	9 (13.4)
Unilateral passable	16 (24.0)
Bilateral impassable	30 (44.8)
Penetrated	12 (17.9)
Total	67 (100.0)

by the insufflation test as belonging to the impassable type immediately before slaughter, patency was found good by the same test immediately after slaughter.

Such a discordance in the results of the test between pre and post mortem, is, first, probably due to the accumulation of mucus in the tubal cavity, especially during the estrous period, which may cause a false or temporary occlusion in the tubes. In fact, of 8 cases examined during the estrous period or 2 days after cessation of the period, 5 showed bilateral impassability, 2 unilateral one, while only 1 showed bilateral good patency. Second, another possibility concerning this problem is that abnormality in the function of the oviduct such as a spasm or cramp of the tubal muscle might play a certain role. However, further study

is required before these assumptions can be clearly explained.

The above findings indicated that it may be dangerous to make a definite diagnosis as true occlusion after only one examination. In dubious cases a retrial is recommended after a few days in order to make the diagnosis more sure. This does not mean, however, that the insufflation test is unreliable; the authors have experienced some cases in which the results of the test obtained pre and post mortem were quite accordant. In addition, in these cases, several small cysts in the oviducts were detected at autopsy, of which the presence could not be suspected by pre mortem rectal palpation.

When the patency of the oviducts is normal, the insufflation test is quite reliable. In general, the air begins to escape from the abdominal os from about 100~120 mmHg pressure and it continues till 60 mmHg or so. HETZEL also stated that the healthy fallopian tubes could be insufflated at pressures of 60~100 mmHg, the air continuing to escape until 40~60 mmHg pressure was reached.

Air penetration into the uterine wall or adjacent tissues occurred in 12 cases (17.9%). In most of those cases, it was not possible to determine whether the oviducts are passable or not. One must do one's best to avoid this improper penetration of air into the tissues. For this purpose, care should be taken in respect to these points: (1) Animals with endometritis or marked endometrial edema (e.g. during estrus and a few days following) and those with endometrial injury (e.g. post uterine irrigation or post uterine biopsy) should not be subjected to this test. (2) The pressure at insufflation should be kept below 150 mmHg; a high pressure should not be continued for a long time. When animals become strained during the manipulation, the stopcock should be opened promptly to decrease the pressure in the uterine cavity. (3) Rapid insufflation should be avoided, especially after the pressure exceeds 100 mmHg.

WILLIAMS<sup>15)</sup> and CEMBROWICZ stated that tuboinsufflation test is accompanied by a danger of uterine rupture. In the present experiment, no danger nor any untoward changes were encountered during or after operation. Even if air penetrates the uterine wall or into the neighboring tissues, it will be absorbed entirely within a week or so. So, re-examination can be made after a week.

As described above, the uterine mucosa becomes very edematous during the estrous stage. This allows air easily to penetrate the uterine mucosa. FOSSUM has also stated that the insufflation test was not suitable at the estrous stage or within a few days following. Therefore, this test should be made during the luteal phase. On the other hand, it has been clearly pointed out by ROWSON et al. and YAMAUCHI et al.<sup>17,18)</sup> that endometritis tends to occur in the luteal phase in the cow. In view of this fact, ROBERTS has suggested that application of the insufflation test during the luteal phase of the cycle might be accompanied by

danger of uterine infection and subsequent peritonitis. In the present experiment, neither endometritis nor peritonitis appeared after the test. Therefore, if complete sanitary care is taken throughout the course of the test, one needs not to be worried about infection.

In conclusion, the insufflation test can be said to be a useful method, though not yet perfect, for diagnosing tubal infertility. If one carefully selects test animals for applying this method in practice, a considerable efficiency will be expected in detecting the disease. However, for the detailed analysis of the changes in pressure in the genital tract throughout the insufflation test, the present authors' method is not suitable. A kymographic insufflation apparatus may be helpful for this purpose.

As for the treatment of tubal infertility, operative or hormonal therapy has been principally prescribed in human gynecology. A more effective therapy has not yet been discovered in either veterinary or human medicine. The majority of investigators including WILLIAMS<sup>14,15</sup>, CEMBROWICZ and MOBERG do not approve of Rubin's insufflation method for the treatment of the cow, because of the possible danger of rupturing the uterus and causing to produce peritonitis. But HETZEL, FOSSUM and others consider this method as harmless and applicable to advantage. Recently, several human gynecologists<sup>5-7,16</sup> in Japan have reported interesting cases in which tubal patency was improved by Rubin's insufflation method. The present authors also have frequently had similar experiences in the cow: gradual improvement of tubal patency after insufflation repeated 2 or 3 times, and success in conception. These facts would suggest that repeated insufflation is effective to some extent for the therapy of certain types of tubal infertility.

#### SUMMARY

Sixty dairy cattle patients have undergone the tuboinsufflation test by the help of the apparatus devised by the present authors. The results obtained and the technique of the test were outlined in this paper. Some considerations were offered concerning this subject. For the purpose of diagnosing tubal patency, the insufflation test as described, though not yet perfect, seems to be helpful for the practitioner. Repeated insufflation is effective to some extent for the therapy of certain types of tubal infertility.

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