

ABDOMINAL PREGNANCIES IN FARM RABBITS

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ABSTRACT

Abdominal pregnancy is defined as the implantation and development of one or several segmented ova or embryos in the peritoneal cavity. Although this has been reported in several species, it is considered as a low incidence process. It is classified as a primary abdominal pregnancy, if there is no evidence of uterine rupture, with presumed regurgitation of early embryos from the uterine tube and as a secondary abdominal pregnancy, when there is evidence of uterine rupture. During a necropsy study of 550 adult fertile female New Zealand white rabbits (*Oryctolagus cuniculus*) from two rabbit farms in Valencia (Spain), the main causes of elimination were studied. Twenty-eight abdominal pregnancies were diagnosed. Seven animals showed no lesions in their reproductive tract. The remaining twenty-one animals showed acute or chronic lesions in the reproductive tract. The classification as a primary or secondary condition is discussed. It may be concluded therefore that extrauterine pregnancies would not be such an unusual finding in rabbits (7.8% in one of the studied), and that this premise should be considered in the diagnostic approach when assessing rabbit doe pathology. New husbandry systems in rabbits such as artificial insemination are factors to be considered.

Key words: Abdominal pregnancy, ectopic pregnancy, rabbit doe, rabbitry, artificial insemination.

INTRODUCTION

Ectopic or extrauterine pregnancy denotes a pregnancy occurring elsewhere than in the cavity of the uterus. The term abdominal pregnancy indicates specifically an implantation in the peritoneal cavity and is usually used interchangeably to describe an ectopic pregnancy (PETERS, 1982).

Abdominal pregnancies, although uncommon, have been described in humans (YOVICH *et al.*, 1985) and in several animal species (HONG and ARMSTRONG, 1978; PETERS, 1982).

According its causes abdominal pregnancy has been categorized as a primary or secondary ectopic pregnancy. Primary ectopic pregnancies would be those in which a fertilized ovum enters the abdominal cavity instead of following the course through the tubal structures, and the entire pregnancy takes place outside of the uterus. Secondary

ectopic pregnancies would be those in which a developing embryo or foetus is dislodged into the abdominal cavity after implantation as a result of a rupture in the uterus, and the pregnancy that was established in the uterus and was then continued in the extrauterine environment (NACK, 2000).

During a necropsy study concerning the main elimination causes of fertile adult females rabbits in two rabbit farms, we have found a high number of abdominal pregnancies. In this work the condition is analyzed with respect to artificial insemination (AI).

MATERIAL AND METHODS

Animals

A total of 550 adult female New Zealand white rabbits (*Oryctolagus cuniculus*), between 6 and 34 months old, were studied (table 1). They had been discarded from the farms by the owners for a variety of reasons. The rabbits came from two farms (M and A), situated on the Mediterranean coast of Spain. In these farms a one-year study was performed where all eliminated rabbit does were analyzed.

One of the farms (M) had AI protocols. Females were primed with a intramuscular (im) injection of PMSG two days before insemination followed by im injection of GnRH at the time of AI. The remaining rabbitry (A) used natural breeding and only AI when the first mating was unsuccessful. This farm had the same AI protocols than M farm.

Pathological studies

All of the rabbits, except one (11M) that died in our facilities, were euthanased. A complete necropsy was performed and any gross lesions observed were recorded for histopathological examination.

Microbiological analysis

Standard microbiological studies were performed from the samples of five foetuses.

Table 1 Distribution of the animals necropsied and abdominal pregnancies found in the farms studied with the type of reproductive protocol.

Farm	Fertilisation	Nº rabbits necropsied	Nº abdominal pregnancies
M	AI	308	24
A	Natural mating	242	4
Total		550	28

RESULTS

Case history and clinical examination

Animals included in the current study were 28 rabbit does discarded from the rabbitries because of the different reasons shown in the table 2. The most frequent causes were failures in mating or insemination and the palpation of intra-abdominal masses (mummified intra or extra-uterine foetuses, abscesses, pyometras, etc).

No clinical signs were present in the studied animals except in three rabbit does that presented lack of appetite and lethargy. One died in our facilities (11M) and the other two (83M and 4A) seemed to be inactive and resented a too extensive palpation of the abdomen. They were febrile but no other abnormalities were noted.

One or more masses were palpated and noted as freely moveable or firmly attached to the abdominal structures in the rabbit does' abdominal cavity. Palpation of the masses did not elicit signs of pain.

On the basis of the clinical and abdominal palpation, abdominal pregnancies were suspected.

Pathological results

After necropsy of the animals, abdominal pregnancies were diagnosed. In 7 animals no lesions were found in the reproductive tract and 21 showed pathological signs of genital tract rupture (table 2).

Animals without gross pathological signs in the reproductive tract:

Of the seven of the rabbits studied that did not show signs of haemorrhage or lesions or anatomical abnormalities of the genital tract, five of these animals were found to have the foetuses unattached (without attachment to omentum or to the serosal surface) in the abdominal cavity (figure 1). The foetuses varied in size (4-8 cm) and number (1 to 6). In one rabbit doe there were two foetuses attached to the omentum and another free in the abdominal cavity at the same time. In this case the free foetus was smaller (4 cm) than the attached foetuses (7 and 8 cm respectively).

In the last case we found three 9-9.5 cm size (term size) foetuses attached to omentum and two of, 2 and 4 cm respectively, free in the abdominal cavity simultaneously with an approximately three weeks of physiological gestation.

In the foetuses attached to the omentum the placental attachment were clearly identified.

All the foetuses were mummified and appeared to be covered by a smooth and yellow/green serosal surface.

Animals with gross pathological signs in the reproductive tract:

Pathological signs of uterus rupture were observed in 21 rabbits and were classified in acute or chronic forms (table 2).

The acute forms were characterized by the presence of the uterus rupture with haemorrhages or, more frequently, organizing haematomas (figure 2). In these cases the foetuses were free in the abdominal cavity surrounded by their own envoltures. This type was identified in eleven animals.



Figure 1. Doe without lesions in reproductive tract (arrow) and six extrauterine different size foetuses in the abdominal cavity (asterisks).



Figure 2. Organizing haematoma in the vagina of a doe with abdominal pregnancy.

The chronic forms, present in ten rabbits, had a more chronic inflammatory reaction probably due to an old uterus rupture. In these cases the most frequent finding was a local fibrous peritonitis located in the uterine serosa, this situation affecting the surrounding tissues in a great number of cases and trapping the extra-uterine foetuses enveloped by the fibrous reaction. However, in both acute and chronic forms, there were free foetuses attached to the omentum or to serosal surfaces of the stomach or the uterus.

The foetuses size was variable, and similar to free foetuses from the animals without lesions. The number of abdominal foetuses found was variable from one to seven.

Other pathologic findings were pyometra; abscesses in renal, intra-abdominal and uterus location; psoroptic mange (*Psoroptes equi cuniculi*) in the ears, purulent mastitis and dental malocclusion (bottom teeth overlap the top teeth).

Pathological results

The foetuses showed moderate autolysis, but no active inflammatory response was seen in the foetal tissues. No lesions were observed in the rest of the tissues collected.

Microbiological results

Negative isolates were obtained from the foetuses collected from the does with abdominal pregnancies.

Table 2 Clinical and pathological data of the rabbit does with abdominal pregnancies.

^A Ref	Age (months)	Causes of discard	Without lesions in reproductiv tract	With lesions in reproductive Acute form	Chronic form
11M	No data	Cachexia	-	YES	-
30M	No data	Mastitis	YES	-	-
47M	9	Cachexia	-	-	YES
50M	6	^B Masses	-	YES	-
81M	19	^B Masses	YES	-	-
83M	No data	Fever	-	YES	-
101	21	^C NP	-	YES	-
112	11	^B Masses	YES	-	-
119	12	^C NP, ^D DM	YES	-	-
125	20	^C NP	-	YES	-
149	32	Mastitis	-	YES	-
173	32	^C NP,	-	-	YES
195	No data	^B Masses	-	-	YES
200	21	Mastitis	-	YES	-
218	8	^C NP	-	-	YES
223	No data	^C NP	-	-	YES
242	20	^C NP	-	-	YES
247	10	^C NP	YES	-	-
286	21	^B Masses	-	-	YES
305	7	^B Masses	YES	-	-
339	No data	^B Masses	-	YES	-
350	No data	^B Masses	-	-	YES
367	31	Mastitis,	-	-	YES
430	34	^C NP	-	-	YES
1A	No data	No data	-	YES	-
2A	9	^C NP	YES	-	-
3A	15	^C NP	-	YES	-
4A	14	Fever	-	YES	-

Footnotes: ^ARef: Identification. ^BMasses: Palpation of intra-abdominal masses. ^CNP: No pregnant (sterile mating or AI); ^DDM: Dental malocclusion; ^EMange: Psoroptic mange.

DISCUSSION

Although both types of abdominal pregnancy, primary and secondary, have been reported in rabbits (SMITH *et al.*, 1989; ARVIDSSON, 1998), the most commonly occurred is the secondary or "false" extrauterine pregnancies (BERGDALL and DYSKO, 1994). Our results agree with this assertion as the rabbits with acute or chronic lesions in the uterus, that could be classified as secondary abdominal pregnancies, were the most numerous.

Seven rabbits did not show evidence of genital tract rupture. It is difficult to know whether these cases were primary or secondary. No evidence of uterine rupture has been reported as specific finding of primary abdominal pregnancy (LOFSTEDT, 1989).

But this absence is not sufficient to rule out a secondary type of occurrence because the possibility of a rupture and regeneration of the uterine tissue exist (PETERS, 1982). Furthermore it has been reported that the abdominal pregnancy to be truly primary, placentation must exist onto a peritoneal or omental surface (PETERS, 1982). We only found placentation in two of the studied animals (112M and 2A). These rabbits, where no scarring was present in the uterus, were also suspected to have a primary abdominal pregnancy.

The invasiveness of placentation and development of ectopic endometrial tissue (endometriosis) are considered to be probably the causes of ectopic pregnancies permitting such fetuses to develop through to term in humans (LOFSTEDT, 1989). Rabbits have a similar type of placentation as humans (CLIMENT and BASCUAS, 1989). This would explain the presence of term size fetuses in several rabbits of this study. The type of placentation in other species does not lend itself to produce a viable extrauterine pregnancy (NACK, 2000). All the studied fetuses were mummified, but the size and the osseous structures of several of them indicated that they may have been viable if a caesarean had been carried out as a suitable moment. Probably, foetal survival extended until placental perfusion became inadequate.

The discovery of an ectopic foetus is often an incidental finding, as the animals may show or not clinical signs of fever, lethargy, anorexia, and intermittent vomiting for several days (ARVIDSSON, 1998). It is unclear why some animals develop clinical signs and others do not. An ectopic foetus can remain undetected for a couple of months to several years before it is diagnosed (SMITH *et al.*, 1989; NACK, 2000). There is no clear association between the duration of the ectopic foetus and development of clinical signs (NACK, 2000). Only three animals showed evident clinical signs (lack of appetite and lethargy) and one finally died. Nevertheless eleven animals were eliminated because they were not pregnant after natural mating or AI.

We found one animal with natural gestation and abdominal pregnancy at the same time. Term pregnancies occurring subsequent to and in conjunction with extrauterine fetuses are documented in other species (HONG and ARMSTRONG, 1978; PETERS, 1982).

Rates of ectopic pregnancy have been increased in the developed world in recent decades (JAMES, 1989). In lagomorphs (hare and rabbits) it has been reported as a relatively frequent condition (MARCATO and ROSMINI, 1986). It is important to note that in spanish rabbit farms though there seems to be a process of low incidence, actually it is impossible to know as it constitutes an incidental necropsy finding, and, in addition, the *in vivo* diagnosis is difficult (ROSELL, 2000). During a three year period only three cases of 447 necropsied does (0.67%) were reported (ROSELL, 2000). Our results show that the incidence is variable in the different farms. In the farm A the incidence of abdominal pregnancies reached a total of 7.8% of all eliminated adult females.

We believe that AI activity could be a factor to consider as abdominal pregnancies have been observed in both of the rabbitries studied that are using AI protocols. In one of these farms AI was only used when natural mating was unsuccessful, which impedes the comparison between the two farms.

On one hand, both farms studied had artificial insemination protocols with inoculation of PMSG and GnRH. The abnormal tubal motility has been proposed as a cause of ectopic and heteropic pregnancies in women treated with gonadotropin (MCBAIN *et al.*, 1980). The relation therefore, between the hormonal treatment and the appearance of extrauterine gestations is not clear; further investigation is needed in this matter.

On the other hand, the insemination is made depositing semen in the vagina or cervix. Sometimes the perforation of the vaginal wall due to deficient manipulation may be produced. In principle this would not be a problem since the vaginal wall route is the preferred method for intraperitoneal insemination in cows and humans (YANIZ *et al.*, 2002) but the vaginal wall can be debilitated and break later because of an increase of the pressure during the gestation causing a secondary extrauterine gestation (MITCHELL, 1989). The manipulation during the insemination could produce the fall of one or several ova from the ovary to the abdominal cavity. The fertilization may be produced in the abdominal cavity by the arrival of spermatozoa through the vaginal wall, or through the reproductive tract (HAWK, 1983). This would cause a primary extrauterine gestation.

CONCLUSIONS

In conclusion we can say that the extrauterine pregnancies would not be such an unusual finding in rabbits if we were to make regular necropsies on animals. The most frequent symptom in these animals was infertility. Therefore extrauterine pregnancies should be considered in the diagnostic approach when assessing rabbit doe pathology. The new production systems in rabbits such as artificial insemination are factors to consider. It is however important to note that many unknown factors exist and that further investigations on the matter are necessary. We will initiate a more balanced and extensive study to investigate the effect of AI in rabbit farms compared with natural mating protocols. The objective is to establish a possible relationship between AI and the occurrence of abdominal pregnancies.

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