Theriogenology Question of the Month

This feature is sponsored by the American College of Theriogenologists. Readers of the JAVMA are invited to submit contributions. Contributions should provide a learning exercise about theriogenology. A specific question should be posed for the readers. The author's answer to the question and a brief discussion should be presented. Possible topics include commonly seen problems in domestic or exotic animals. Herd problems in dairy and beef cattle, sheep, goats, horses, and exotic hoofstock, problems in kennels or catteries, or flock problems in domestic and exotic fowl also are appropriate. Please contact Dr. Craig A. Smith, Associate Editor (800/248-2862, ext 259, or FAX 847/925-1329), for further details.

History
A 4.5-year-old spayed female Himalayan cat with a history of 3 or 4 days of decreased appetite, retching, and vomiting was admitted to our hospital. Another person had previously owned the cat, and it had been ovariophrectomized at the request of the previous owner by another veterinarian 14 months prior to admission.

Physical examination revealed a firm, freely movable mass (approx 3 cm in diameter) in the ventral aspect of the midabdominal region. Palpation of the mass did not elicit signs of pain. Abdominal radiography revealed a 3.5 × 2.5-cm mineralized structure in the ventral aspect of the abdomen (Fig 1). It was located to the right of the midline and cranial to the urinary bladder, and it appeared to be tightly curled with a mixture of bone and soft-tissue opacities. Hematologic and biochemical analyses were not performed.

Question
What is the most likely cause for this mass?
Please see the next page.

This report was submitted by Robert A. Nack, DVM, Parkview Animal Hospital, 2508 Maiden Ln, Joplin, MO 64804.

Figure 1—Lateral (top) and ventrodorsal (bottom) radiographic views of the abdomen of a 4.5-year-old spayed female Himalayan cat with a firm mass palpable in the ventral aspect of the midabdominal region.
humans to explain ectopic fetuses in cats. Causes of

ectopic pregnancy in cats, leading to much confusion.

Outcome and Management

On the basis of the tentative diagnosis of an ectopic fetus, surgery was elected to remove the struc-
ture. Exploratory celiotomy revealed a 5.5 × 3-cm
mummified fetus. The fetus was fully formed and had
hair. It was covered in a thin membrane that was sur-
rounded by a tan, apparently cord-like structure; this
structure attached the mummified fetus to the omen-
tum. The uterus and ovaries were not detected, nor
was a uterine stump evident.

Histologic examination of formalin-fixed tissues
from the membrane surrounding the fetus, tan cord-
like structure, and omentum were performed. The
cord-like structure and omentum were histologically
similar. They were composed of cells with prominent
vacuoles with sharp edges surrounded by a pink
eosinophilic outline without nuclei (fat necrosis).
Surrounding the fat necrosis was a rim of organized
fibroblasts (fibrotic capsule). The thin membrane was
composed of a band of homogenous eosinophilic mater-
ial without nuclei and multilocal regions of basophilic
substance (mineralization).

Discussions with the previous owner and the vet-
erinarian who performed the ovariohysterectomy
revealed that the cat was multiparous and had been
pregnant at the time of ovariohysterectomy 14 months
earlier. Uterine rupture was not noticed at the time of
ovariohysterectomy. Thus, there were apparently 2
possible explanations for the ectopic fetus. First, a fer-
tilized ovum or developing embryo or fetus was dis-
lodged during the manipulation of structures at the
time of ovariohysterectomy, allowing establishment of
an ectopic pregnancy after surgery. Second, the fetus
was from a prior pregnancy and was not noticed at the
time of ovariohysterectomy. Because none of the find-
ings indicated that the fetus had maintained viability
outside of the uterus (ie, lack of placentation), it was
identified as an ectopic fetus that had developed in
utero and been displaced to an extrauterine location.

Discussion

It has been proposed that ectopic pregnancy can
develop in the peritoneal cavity, provided the right cir-
cumstances happen (eg, trauma or surgical manipula-
tion during pregnancy). Placental sites would have to
be established in ectopic endometrial tissue for a blood
supply to be established and the fetus to develop in the
peritoneal cavity. Results of the histologic examination
of the fetus and surrounding tissues did not reveal that
the fetus reported here was viable within the abdomi-
nal cavity at any point, on the basis of necrosis and lack
of cellular details. It was not possible to differentiate
placental or endometrial tissue from the omentum
because of the loss of tissue differential staining.
Therefore, a diagnosis of ectopic pregnancy was not
proven.

Several textbooks1-3 have discussed the topic of
ectopic pregnancy in cats, leading to much confusion.
Reports in journals extrapolate the condition in
humans to explain ectopic fetuses in cats. Causes of
abdominal pregnancy have been categorized as a pri-
mary or secondary ectopic pregnancy. Primary ectopic
pregnancies would be those in which a fertilized ovum
entered the abdominal cavity instead of following a
course through the tubal structures, and the entire
pregnancy took place outside the uterus. Secondary
ectopic pregnancies would be those in which a devel-
op ping embryo or fetus was dislodged into the abdomi-
nal cavity as a result of rupturing of the uterus, and the
pregnancy that was established in the uterus then was
continued in the extrauterine environment. Placentation of
such a wayward fertilized ovum or dis-
placed embryo or fetus onto the mesentery, omentum,
or peritoneum has only been presumed on the basis of
cases of ectopic pregnancy in humans; however, to my
knowledge, it has not been proven histologically in
cats. Assuming placentation was to take place, the
embryo or fetus could continue to develop. Such devel-
opment could last only a short time or could encom-
pass a substantial period to enable delivery of a near-
term viable fetus.5 Death of the fetus is inevitably
caused by inadequate blood supply, although there is
anecdotal evidence of surgical delivery of live offspring
from an ectopic pregnancy in cats.6

Most of the reported ectopic pregnancies in cats are
believed to be the result of uterine rupture and have
been categorized as secondary to iatrogenic or traumatic
rupture of the uterus.7 Primary ectopic pregnancy has
been proposed in some cats but appears to be rare and,
again, would be difficult to verify. Development of a pri-
mary ectopic pregnancy has been considered to be the
result of physical handling of the fallopian tubes during
ovariohysterectomy within 3 or 4 days after coitus, thus
dislodging fertilized ova into the abdomen. Naturally
occurring primary ectopic pregnancy has been anecdo-
tally reported in cats.6 A final possible cause for ectopic
pregnancy involves abnormal reproductive anatomy
such as a urachal remnant or fistulous tracts.7 These
abnormal structures would allow sperm to reach and
fertilize an ovum but not allow the uterine tract to
receive the fertilized ovum. This situation, however,
appears to be even more rare.

In humans, the invasiveness of placentation and
development of ectopic endometrial tissue (endo-
metriosis) are probably the reasons that it is possible
for ectopic pregnancies to become established and
allow such fetuses to develop to term.8 The type of pla-
centation in cats does not lend itself to produce a viable
extrauterine pregnancy. Furthermore, to my knowl-
edge, endometriosis has not been reported in cats.
Therefore, true extrauterine viable pregnancy does not
seem likely in cats.

The discovery of an ectopic fetus is often an inci-
dental finding, whereas in other situations, a cat may
have had clinical signs of fever, lethargy, anorexia, and
intermittent vomiting for several days. It is unclear
why some cats develop clinical signs and others do not.
An ectopic fetus can remain undetected for a couple of
months to several years before it is diagnosed. There is
not a clear association between duration for the ectopic
fetus and development of clinical signs. The number of
ectopic fetuses can vary from 1 to 4, and they typically
are mummified at the time of removal. Radiographic
features of an ectopic abdominal fetus include a rounded, tightly curled fetal outline, unusual clarity of the fetus (i.e., fetal bones are obviously more radio-opaque and clearly contrasted as a result of lack of fluids to mask detail), and identification of a fetus in a location not typically associated with a normal uterus.3

Ultrasonography would be useful in achieving a diagnosis. Findings may include evidence of free abdominal fluid with fine echogenic strands and identification of a fetus outside the uterus. Ultrasonographic findings of a viable fetus or histologic documentation of placentation of a mummified fetus is needed to classify an ectopic fetus as being the result of an ectopic pregnancy.

References