THESIS FOR M.D. DEGREE

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TITLE OF THESIS:

That secondary ulceration of the
intestines is an insidious complication
found at a comparatively early stage in
a high percentage of cases of pulmonary
tuberculosis, and that the detection of
occult blood by means of the benzidine
test in the faeces of such cases, is a
useful and necessary method of diagnosis
of the condition.

I hereby declare that this thesis is composed
by myself.

29th September, 1932.

Intestinal ulceration has been recognised since the time of Hippocrates as a grave and usually fatal complication appearing in the later stages of certain cases of pulmonary tuberculosis, but it is only within comparatively recent years that doubt has arisen as to its being purely a terminal condition.

One is familiar with the case of pronounced tuberculous ulceration of the intestine. The marked pallor and emaciation of the patient, the anorexia, and indigestion together with profuse diarrhoea, colicky pains and points of tenderness in a scaphoid abdomen make the diagnosis obvious. Very often this severe abdominal condition is present when the concomitant pulmonary disease is comparatively inextensive, but the opposite picture is much more frequently encountered; the pulmonary tuberculosis is extensive and obvious while the intestinal disease is of lesser extent and, being insidious, passes unnoticed. It is the contention of the writer that intestinal ulceration occurs as a complication of pulmonary tuberculosis much more frequently and at an earlier stage than is perhaps generally realised.

Modern methods of treatment of pulmonary tuberculosis, by concentration of cases in special hospitals and sanatoria, tend to emphasize the

importance of the lung lesion and, unless one is
careful, one begins to think of the disease as being
purely respiratory, and to overlook its true character
of a generalised infection which can, and does, manifest
itself in almost every tissue in the body, though
tending in most cases to select the lung tissue as its
primary point of attack. This attitude towards the
disease is reflected in the literature of tuberculosis.
An extraordinary mass of material has been written
upon the pulmonary aspect of the disease, while that
written upon its intestinal and other aspects is
relatively scanty. This lack of investigation appears
to be particularly marked in this country, while
American and continental observers have given much
more attention to the lesions of the intestine.

Pulmonary tuberculosis is recognised to be
insidious in its onset as are most other forms of
tuberculosis, but of all its manifestations, that in
which the onset is most insidious is probably
intestinal ulceration. The symptoms of the condition
are diarrhoea, abdominal pain, anorexia and general
gastro-intestinal disturbance. Of these, diarrhoea
and abdominal pain are sufficiently clamant, but both
are late symptoms and may not be present at any stage,
while the diarrhoea is frequently replaced by

constipation.   The others, anorexia and indigestion,
may be early symptoms,but the patient is already
suffering from pulmonary tuberculosis which is in
itself an eminently satisfactory explanation of their
presence.   It has, indeed, been widely stated
(Gwerder & Kalmar (1), Poulton (2) and others) that
diarrhoea may be caused by the intoxication of
pulmonary tuberculosis;   this is doubtless true in
some cases but, in sanatoria especially, diarrhoea is
a rare condition, and its occurrence in the absence of
some obvious cause ought to suggest the presence of
intestinal ulceration until this possibility has been
eliminated.

To gain a true conception of the incidence
of the condition one must turn to the results found at
autopsy.   The figures of percentage of cases of
pulmonary tuberculosis which were found post mortem to
have suffered from intestinal ulceration,vary
considerably. On the one hand the figure of 50% is
given by such authorities as Price (3), Conybeare (4)
Sims Woodhead (5) and Hare. This indeed is arresting
but Osler (6) gives it as 56%. Topley & Bosanquet (7)
as 50 - 66%, Guy (8) 61%, Heaf (9) 63%. Then Louis
gives 81% and Frerichs, Honing,Herscheimer ,& Weigert
(10) give 90% of cases of pulmonary tuberculosis

showing intestinal ulceration at death. In the
writer's own experience, out of 27 autopsies upon
such cases 23 showed intestinal ulceration, and
although this is admittedly too small a number from
which to calculate a percentage, yet one cannot but
suspect that the higher figures between 80 and 90% are
probably the more correct. In order to account for
the great difference of 40% between the highest and
lowest figures,the writer suggests that the observers
who obtained the lower figures were content to examine
the intestines from the peritoneal aspect, while those
who, like the writer,found the condition to be more
frequent performed complete evisceration, and,
slitting the intestines from end to end, examined the
mucosa carefully under a stream of water. It is
certain that while in many cases the ulcers are
obvious from the peritoneal surface, yet in others
the ulceration, being confined to the mucous and
submucous layers, is quite invisible from the
peritoneal aspect.

Surely then a condition, which, at a consevative
estimate, is present in over three fourths of patients
dying from the disease, is of some consequence, yet
the writer is convinced that, except in a
comparatively small number of pronounced cases, the
element of intestinal ulceration is left out of account

in the care of patients suffering from pulmonary
tuberculosis.   It is commonly regarded as a terminal
condition;   in some cases it probably is terminal or
sub-terminal ,though it will be shown that in a large
number of cases ulceration is present many months and
indeed years before death;   but even though it may
occur terminally, may it not be a contributary cause
rather than, as would seem to be implied, a result of
approaching dissolution?   The presence of ulcers in
the intestines must interfere markedly with their
motility and ,if at all extensive ,with their function
of absorption as well, so that the nutrition of the
patient, which plays such an important part in his
fight against tuberculosis, must be impaired.

        For diagnostic purposes the writer has found
clinical examination to be most unsatisfactory.   The
most that one can expect to find in the usual case
are one or more areas of tenderness on palpation,
which are frequently absent in cases where ulceration
has been demonstrated by other methods and, indeed,
this local tenderness is apt to be indefinite and
inconstant.   The condition thus fails to make itself
obvious and even should it be suspected, it is often
difficult to prove its presence.

        The disease is, then, unobtrusive as to

symptoms, and ordinary methods of clinical examination
are insufficient for purposes of diagnosis.   There
are however various special methods of investigation
which may be of value.   These are:-

> (1) the examination of the faeces for the
>   presence of tubercle bacilli.
> (2) the examination of the faeces to detect
>   the presence of occult blood.
> (3) the roentgenological examination of the
>   intestines filled with an opaque substance.

(1) As regards the first of these methods,
various investigators have demonstrated the presence
of tubercle bacilli in percentages approaching closely
to one hundred of all cases whose sputum shows the
bacillus.

The figures given by Sir Robert Philip and
A.E. Porter (II) from their investigations of this
subject are most conclusive.   Not only did they find
tubercle bacilli in the faeces of 33 out of 34 cases
where they were present in the sputum, but they found
them also present in 29 out of 42 cases where the
sputum was free from tubercle bacilli, and in 17 out
of 24 cases which produced no sputum whatever.   All
these cases suffered from tuberculosis, but none from

intestinal tuberculosis.   The faeces of 9 non-
tuberculous cases which they examined showed no
tubercle bacilli. Such results require no
elaboration.   It would be difficult to find a more
effective argument against the diagnosis of
intestinal ulceration by the presence of tubercle
bacilli in the faeces.   It is claimed,however,that
cases suffering from intestinal ulceration show the
bacilli in clumps, whereas in cases where the bacilli
originate in the sputum they are usually discrete.

(2) The presence of occult blood in the
stools may be detected by spectroscopic or chemical
tests, viz. the guiac or the benzidine tests.   As
these tests are delicate, precautions must be taken
to ensure that no blood is ingested with the food,
nor admitted to the intestines from the upper reaches
of the alimentary or respiratory tracts, or from such
rectal conditions as fistulae or haemorrhoids. Such
sources being excluded as well as all drugs liable to
produce fallacies, it is reasonable to assume that
any occult blood detected in the faeces by the test
is derived from intestinal ulceration.   In the
writer's investigations the benzidine test was used
and found to be satisfactory, although on account of
its extreme delicacy the greatest care had to be

taken to eliminate all possible sources of extraneous blood.

It is presumed that the constant movements of the intestines and the spasm induced by the actual presence of the ulcer, cause haemorrhage from its surface in minimal quantities.   In this connection L.V. Gardner (12) studying the histology of tuberculous intestinal ulceration makes an interesting observation " ---- the granulation tissue forming the floor and edges of the ulcer is extremely rich in very large, thin-walled blood vessels.   In no case has evidence of thrombosis been detected either in the newly-formed vessels or in those originally formed in the organ.   The necrotising process must frequently open many of these immature vessels and result in a certain amount of haemorrhage".   Where the ulcers are numerous it is probable that every sample of the faeces taken will contain a small amount.   Where the ulcers are few in number, however, no blood may be present in the sample of faeces taken, but on repeated examination it is probable that a positive result will be obtained, whereas repeated examinations will all prove negative should no ulceration be present.

A positive result, then, is presumed to show the presence of ulceration somewhere in the alimentary

tract, but there is no indication as to the site of the ulcer. The presence of occult blood in the faeces may, of course, be due to other types of alimentary ulceration such as peptic ulcer or neoplasm; - these must be eliminated by their other signs though the writer cannot recall the occurrence of an undoubted peptic ulcer in a case of pulmonary tuberculosis, and the simultaneous presence of tuberculosis and cancer is comparatively rare.

(3) The radiological method of diagnosis entails the repeated observation of an opaque meal or opaque enema as it passes through the intestines. Observation by means of the fluorescent screen is an essencial part of the procedure, as the various parts of the intestines must be separated as far as possible by means of palpation of the patient's abdomen while he is being examined behind the screen. X-Ray plates may be taken at intervals in addition, though the writer considers them unnecessary. They will yield a clear picture which may be studied at leisure, although with a good screen and efficient darkening of the room, fluoroscopy can be quite clear and definite. It is, of not absolutely necessary, at least convenient to have a permanent record of the radiological appearances and this may be effected either by means

of X-Ray plates or careful sketches of one's

impressions of the screen examination. Examinations

must be made at intervals from the third or fourth

till the fourteenth hour after the meal is

administered, or even longer, and again at, or

about, the twenty-fourth hour.

Evidence of ulceration is said to be

hypermotility of the intestines, with the presence of

filling-defects or areas of the intestine which are

never at any examination found to contain the opaque

substance. Complete evacuation of the meal by the

twenty-fourth hour is held to indicate ulceration.

Comparison of Radiological and Occult Blood methods.

The radiological method has an advantage

over the occult blood method, in that it will

demonstrate the exact site of any ulceration situated

in the caecum, ascending colon, or possibly in the

transverse colon. The filling of the small intestine

and of the parts of the colon distal to the transverse

colon with the opaque substance is, in the opinion of

the writer, too indefinite to allow of diagnosis of

ulceration in these regions. This is a definite

disadvantage in that the lower end of the ileum shows

a somewhat greater incidence of ulceration than does

the caecum, and is in many cases the sole site of

ulceration. It may be possible also that small

ulcers of the caecum and ascending colon will escape
diagnosis since they may not produce sufficient spasm
to cause a filling-defect.

Another disadvantage of the radiological
method is the fact that it entails at least six or
seven visits of the patient to the X-Ray room, which
causes considerable distress to a sick patient and
may be quite beyond his strength.   The occult blood
method, on the other hand, necessitates no unusual
effort on the part of the patient, and can be arranged
on a routine scale even in a large hospital.

The radiologist must have considerable
experience in this particular work in order to observe
correctly the movements and defects of the barium
column.   Such experience can only be obtained by
repeated investigations of these cases, whereas in the
case of the beuzidine test the personal factor is to
a great extent eliminated, and a definite positive or
negative result can be given from the test.

The optimum position is, however, that the
tests should be complementary;   a routine examination
of all cases by means of the benzidine test, with,
where possible, a radiological examination of those
found to be positive by the other.   Then, if the
ulceration is in the caecum and ascending colon it

Explanation of Symbols in Table of
Autopsy Findings.

Colon, Caecum, Ileum, Jejunum.

Numbers indicate numbers of ulcers found.

"Ext." - indicates extensive confluent ulceration
rendering enumeration impossible.

"29 →" indicates that 29 ulcers were present
in the ileum and jejunum, the greater
number being in the ileum but that the
ulceration extended into the jejunum, or
vice versa.

"Meckel" indicates the presence of a Meckel's
diverticulum in which a tuberculous
ulcer was found.

"1-C Valve" - "+" indicates the presence of
ulceration of the ileo-caecal valve.

Peritonitis - "+" indicates its presence.

App. - "+" indicates the presence of empyaema
of the appendix.

Symptoms
P indicates abdominal pain.
D indicates diarrhoea.
C indicates constipation.

AUTOPSY FINDINGS.

Case No.	Colon	Caecum	1 - C Valve	Ileum	Jejunum	Periton - itis.	App.	Symp- toms.
	Extent of Ulceration					Complications.		
16	12	Ext.	+	-	-	-	+	-
18	-	-	-	13	-	+	-	P
21	-	1	-	1	-	-	-	-
59	-	1	-	1	-	-	-	P+C
95	10	2	+	13 →		-	-	-
104	50	Ext.	-	← 18		-	-	P+D
105	6	Ext.	-	3	-	-	+	-
143	-	1	-	47 →		-	-	P+D
144	-	2	-	-	-	-	-	-
145	7	9	-	-	-	-	-	-
147	-	5	-	24	-	-	-	-
148	-	-	-	9	-	-	-	-
149	-	-	-	-	-	-	-	-
150	2	Ext.	+	63 →		-	-	P+D
151	-	Ext.	+	71 →		+	-	P+D
152	-	1	+	29 →		-	-	P
159	2	4	-	15 →		+	-	P+C
160	-	1	-	7	-	-	-	-
161	-	2	+	9	-	-	-	-
162	2	4	-	2 (Meckel) ←	7	-	+	-
163	4	5	-	39 →		-	-	-
176	-	-	-	-	-	-	-	-
183	-	1	-	1	-	-	-	-
226	27	Ext.	+	76 →		-	-	P+D
227	6	7	-	5	-	-	-	-

will probably be indicated, while if no ulceration
can be diagnosed by X-Ray the probability will be that
there is ulceration of the small intestine.

Post-Mortem Examinations.

Autopsies were performed on 27 cases of
pulmonary tuberculosis - these were consecutive in so
far as the necessary permission could be obtained, and
there was no selection of cases likely to have
abdominal complications. They were performed in the
usual manner, particular attention being given to the
condition of the lungs and the intestines. The latter
were examined in situ, then completely removed from
the abdomen and, having been opened from end to end,
were carefully examined for ulceration under a stream
of water.

It was found that in 23 cases ulceration of
the intestine was present. The ulcers varied in size
from minute excavations of 1/10" diameter, to large
areas of ulceration extending completely round the gut
and 4 or 5 inches in length, with several islets of
mucosa on their surface. Their shape varied from
circular to elongated, and of the latter the long
diameter was sometimes across the gut and sometimes in
a longitudinal direction. This fact is notable in
that it does not affirm the classical distinction

between tuberculous and typhoid ulcers in the
intestine, and there was no history in any of the
cases of a preceding typhoid infection which might
possibly have confused the issue. Ulcers of the
small intestine tended to be elongated (in either
direction), while the shape of ulcers of the caecum
and colon was usually circular. They were found on
all parts of the circumference of the intestine with
a preponderance, in the small intestine particularly,
situated on the wall opposite that which gave
attachment to the mesentery. They varied
considerably in character, always having one factor
in common - in each case the edges were undermined.
In some cases they were shallow involving only the
mucous membrane, the floor being smooth and
homogeneous while the edges were not indurated and
unthickened and the ulcer was quite imperceptible
from the peritoneal surface. Others were deeper
with rough injected floors, edges thick and indurated
and studded with small nodules which appeared to be
tubercles. These ulcers were visible from the
peritoneal aspect which in many cases was likewise
studded with tubercles. There was a special type
noticed in the caecum in cases where the ulceration
was inextensive. These were usually two in number

situated one on either side of the ileo-caecal
orifice, on the folds of mucous membrane running from
the extremities of the valve.   They were shallow
ulcers about 3/4" in length by 1/4" in breadth with
the ends pointed as opposed to the rounded ends of
elongated ulcers in other situations.

The extent of the ulceration varied within
wide limits.   On the one hand, a certain case showed
one small ulcer less than 1/4" in diameter in the
ileum and another 1/2" in diameter in the caecum,
whereas at the other end of the scale a case was
noted in which there were 76 ulcers in the ileum and
jejunum, 27 ulcers in the colon, and the caecum was
so extensively ulcerated that differenciation of the
ulcers was found to be impossible.

With regard to sites of greatest incidence
of ulceration, it was found with approximately equal
frequency in both large and small intestines, while
the ulcers tended to decrease in number as the
distance from the ileo-caecal valve increased.   In a
few cases however more ulcers were found in the
jejunum than in the ileum, and in a few others, more
in the colon than in the caecum.   In the writer's
series no ulceration was noticed higher than the
jejunum nor lower than the sigmoid colon.

Ulceration may be confined either to the small or to the large intestine, although it is general to find it present in both.   Thus, of the 23 cases showing ulceration, in 3 it was present in the caecum and colon and absent from the ileum and jejunum; while in 2 cases there were no ulcers in the large intestine but several in the ileum.   This latter condition shows the necessity of having other methods of examination as well as radiography,in which small intestine ulceration would probably be missed.   The ulceration in these cases is not negligible in extent, as 9 ulcers were present in the ileum in one case, and 13 in the other.   It must also be remembered that these findings were elicited post-mortem, - it is possible that this condition in which the small intestine alone is ulcerated, may occur with greater frequency in the earlier stages during life.   Of the 3 cases where ulceration was present in the large intestine alone, one is remarkable in its extent, showing 12 ulcers in the ascending and transverse colons while the caecum showed extensive confluent ulceration.

The great incidence of the ulceration in the lower end of the ileum and caecum favours, in the writer's opinion, the theory that the cause of the

condition is auto-reinfection from bacilli swallowed in the sputum, for it is in these regions that the food material is long delayed while in a semifluid state.   In this connection also, it may be noted that the ileo-caecal valve itself is a favourite site of ulceration as well as the mucosa in its immediate vicinity.   It is worthy of mention that in one case, where Meckel's diverticulum was present and without attachment to the abdominal wall by any ligament which could carry a blood vessel, a typical tuberculous ulcer was found at the apex of the cul-de-sac.   It is suggested by the writer that, if tuberculous ulceration of the intestine is secondary to chronic pulmonary tuberculosis by means of a reinfection from bacilli swallowed in the sputum, it must follow, in its initial stages at least, the conditions of the Phenomenon of Koch.   It must be presumed that, by virtue of his chronic pulmonary disease, the patient has acquired a certain amount of resistance to the tubercle bacillus.   The bacillus, then, on permeating the intestinal mucous membrane, will not be absorbed into the lymph stream, but will cause a superficial necrosis of the immediately adjacent mucosa, which will be cast off as a slough leaving a shallow ulcer.

Thenceforward this theoretical pathology becomes more obscure. Koch was dealing with a single dose of bacilli administered subcutaneously and found that the ulcer so produced healed rapidly. A similar ulcer in the intestine, however, is not in such a favourable position, being subject to the action of the bacteria including large numbers of tubercle bacilli found in the intestinal contents. These bacilli may find an easy site of entry in the damaged epithelium at the edge of the original ulcer with consequent enlargement of the latter. It appears to the writer that some such pathology might explain the absence of gross lymphatic involvement which is found in many progressive cases of secondary intestinal ulceration, while in the primary tuberculous ulceration of children the lymph glands are prominent. Provided also that this pathology were correct, it would follow that tuberculous ulcers of the intestine would show a greater tendency to heal if absolute exclusion of the bacilli from the alimentary tract could be attained. It is however impossible to prevent the swallowing of small quantities of sputum, and there still remains the possibility of their excretion by means of the biliary tract.

In two of the cases death was due to
tuberculous peritonitis, while in 3 cases the appendix
was found to be the site of empyaema, tubercle bacilli
not being, however, present in the pus.   In these
cases the appendix was not adherent to the surrounding
tissues, and there had been no history of pain in the
right iliac fossa.   Most of the cases in which an
autopsy was performed had died of chronic pulmonary
tuberculosis, but in 5 of them the patients died
suddenly of an acute complication - 2 from meningitis
and 3 from acute miliary spread in the lungs following
haemoptysis, yet intestinal ulceration was present in
each of these cases.   Now, had the pulmonary
tuberculosis run its usual chronic course 4 of these
cases had a prospect of a farther 3 or 4 years of life,
while the other had probably only a further 6 months.
Yet in the 4 cases,ulceration had proceeded to a
considerable extent and, in view of their prospect of
life, could not be regarded as being terminal.   It
is remarkable that the remaining case, with only a 6-
months prospect, was that one previously noted which
showed only two small ulcers.

4 out of the 27 autopsies revealed no
evidence of intestinal ulceration, and a study of these

cases with a view to finding a reason for their
escape elicited the following facts.

One of these cases had a history of sudden
onset after a haemoptysis, he soon became somewhat
delirious and was comatose at intervals before death.
Autopsy revealed a very old, fibrosed lesion about
the size of a walnut at the right apex with no
caseation or infiltration, but the lungs were studded
throughout with miliary tubercles.   The case was ,
consequently, not one of chronic pulmonary tuberculosis
and may therefore in fairness be left out of
consideration.

The remaining 3 negative cases each had a
long history of pulmonary tuberculosis with records of
tubercle bacilli in their sputum for years, their only
feature in common being that their pulmonary disease
showed heavy fibrosis and had caused considerable
dyspnoea and bronchitis.   This factor they likewise
had in common with several of the cases where
ulceration was least extensive.   The cause of their
immunity from ulceration may therefore be associated
with the cause of the marked fibrotic reaction in the
lungs.   Goldberg, Sweeny & Brown (13) also found
that cases of pulmonary tuberculosis which showed no
ulceration, fell into 2 groups, viz. those dying from

an acute pneumonic form of tuberculosis, and those
with very chronic fibroid lesions.

Of the cases which came to autopsy, 9
suffered from tuberculous laryngitis, and in each,
intestinal ulceration was present, in most of them to
a very marked degree.

Barium Meal Examinations.

Stierlin in 1911 appears to have been the
first to apply radiology successfully to the study of
tuberculous ulceration of the intestine.   He was
probably the first to notice the absence of opaque
substance from the region of the caecum and ascending
colon, while both the ileum and transverse colon were
well filled (Stierlin's Sign);   this in contra −
distinction to the clarity with which the column of
opaque substance stands out in a normal colon. This
fact, the basis of the present system of diagnosis does
not appear to have been widely recognised at that time,
and few real advances were made for some years. It
was left to Brown and Sampson of the Trudeau Institute
to develop the subject thoroughly, and from their
investigations upon several thousands of cases they
appear to have definitely established the radiological
method of diagnosis of intestinal ulceration.

Valuable information may be obtained by this method, but for various reasons its scope is very limited. An opaque meal introduced into the stomach will normally fill the stomach from below upwards to a varying level, and completely from side to side, and the meal will lie in the organ for some considerable period. The normal conditions, thus, are fairly constant and the radiologist, observing a deviation from these normal conditions, is fairly safe in assuming that he is dealing with some pathological phenomenon. The intestines, however, form a tube along which the opaque substance passes with varying degrees of rapidity, whose shape is not so constant for such long periods, and which may not, even in normal circumstances, fill completely with the opaque substance. The limits of the normal are consequently much wider and there is less time in which to examine each particular part. Since one cannot control the filling of the suspected portion of the gut but must await its filling in its due order, one is liable to miss the best moments for examination, as it is impossible to keep the meal under continuous observation throughout its passage.

Furthermore, the stomach can be examined without any complicating opacities in other parts of the gut, whereas the particular part of the intestine

which one wishes to examine, may be totally or
partially obscured by opaque substance in superimposed
parts of the intestine.   This latter condition is
one of the main disadvantages of the X-Ray plate in
comparison with fluoroscopic examination.   It may
suggest that the suspected region is completely filled
when actually filling is defective, or that there is
an irregularity of outline which is not present, or
it may render difficult the identification and
delineation of a structure and otherwise generally
complicate the picture.   During fluoroscopy on the
other hand one can, by palpation of the patient's
abdomen, in many cases completely separate
superimposed structures, or by studying their
respective movements under palpation approximately
determine their outline.   It is sometimes possible,
also by means of palpation, to initiate contraction
of the intestine, and observation of the opaque
substance actually passing along the suspected
segment may be of the highest value in diagnosis.

It will readily be admitted that the stomach
is the part of the alimentary tract concerning which
radiology probably yields the most accurate
information, and it is in those parts of the

intestines wherein the conditions approximate most
closely to those in the stomach, that we may expect
X-Rays to be most useful.   It is therefore in the
caecum and ascending colon that one may hope to find
reliable evidence of ulceration, and fortunately, this
region is ulcerated in a large percentage of all
cases where ulceration is present, as was demonstrated
by the results of the post-mortem examinations.   In
the small intestine the incidence of ulceration is
probably somewhat greater than in the caecum and
ascending colon, but here the movement of the
intestinal contents is much too rapid and the position
and outline of the coils too irregular, to allow of
any information being obtained from a direct view of
them.   Conditions are somewhat similar in the
descending and iliac colons, while the transverse
colon, being more or less horizontal in position,
yields somewhat doubtful information.   The sigmoid
colon frequently fills well, but it is comparatively
rare to find ulceration so low.

        It is therefore the writer's opinion that
the comparatively small length of the caecum and
ascending colon, is the only section of the intestines
in which it is possible, by means of radioscopy of an
opaque meal, to diagnose intestinal ulceration with

any confidence.

The technique used in the present examinations was based on that advocated by Brown & Sampson of the Trudeau Institute though differing from it in several respects. Laxatives were inhibited on the day previous to the examination in order to prevent any artificial hypermotility arising from their use. The opaque meal consisted of 4 ounces of Barium Sulphate in 12 ounces of milk with 1/2 ounce each of flour, cocoa and sugar,to improve the consistency and taste. This meal was administered at 7 a.m. and the usual breakfast followed at 8.15 a.m. The patient was screened at 10.30 a.m., 12.30 p.m., 2.30 p.m., 4.30 p.m., 6.15 p.m., and 8 p.m. He was also screened at 10.30 a.m. on the following morning having previously attempted a natural opening of the bowels. The ordinary meals were allowed during the course of the examination - dinner at 1 p.m., a light tea at 4.15 p.m., and supper at 6.30 p.m.

The Trudeau observers advise omission of all food and drink till after examination at the seventh hour from taking the opaque meal.[14] This method was tried but,in the opinion of the writer,it tended to delay the normal movements of the intestines while serving no useful purpose. It was considered that

the regular routine of meals should be interfered with
as little as possible, in order that the intestines
might receive their normal stimuli and so move in a
manner as nearly normal as possible. The taking of
food is recognised as a stimulus to more active
movement on the part of the intestines, and it is
sufficiently difficult to get enough observations
recorded during the day, without delaying matters by
withdrawing the usual meals.

In order to obtain clear definition of
outline on the fluoroscopic screen, it was found that
perfect darkness was necessary in the room, and that a
generous allowance of time had to be devoted to
accommodation of the eyes to the darkness. This
period was found to vary considerably; an interval
of only two or three minutes darkness was required
after ordinary degrees of artificial lighting, but
bright sunlight necessitated a period of fifteen or
twenty minutes before accommodation to darkness was
acquired. Partially opaque glasses, if they can be
worn prior to the examination, considerably reduce the
time which must be devoted to this very necessary
procedure.

When screening, every part of the abdomen
was examined thoroughly, particular attention being

paid to the site of the caecum and ascending colon,
and the exact shape of all the black areas noted in
order that an accurate diagram might be drawn
immediately afterwards.   This was found useful as a
permanent record and for comparison with the diagrams
made at the other observations.   After having drawn
a number of these sketches one soon learned to produce
a fairly detailed picture of what was seen on
fluoroscopy.

      Various points must be noticed particularly.

Stomach - The presence and amount of opaque substance,
    and its position with regard to bony landmarks, (in
    order that the presence of the meal in it may not
    be missed at some future observation on account of
    superimposition of, say, the transverse colon). Its
    activity and tonicity should also be noted.

Small Intestine - The presence and amount of opaque
    substance.

Caecum and Ascending Colon - This is the most
    important part of the examination and great care
    must be exercised in identifying and delineating
    these segments.   Usually this is easy, but the
    caecum may vary considerably in position, and it is
    frequently difficult, and sometimes impossible to
    to examine it thoroughly, until the ileum is

completely emptied, which detracts from the

confidence of one's diagnosis.   By means of

palpation, however, it is usually possible to obtain

either a clear view of the caecum, or an interrupted

one from which its shape can be deduced with fair

accuracy.   If there is barium in the ileum and in

the transverse colon, normally the caecum and

ascending colon should present a complete unbroken

column of barium, with sementation well marked in

Sketch 1.

the colon and possibly present in the caecum as well.

Departure from this ideal should not however be

sufficient ground for diagnosis of ulceration.

If there is an absence of barium from a particular

point in this column, which is persistent through

several observations while barium is still present

both above and below it, then one may, with

considerable confidence, diagnose the presence of

an ulcer at that point.   It is however important,

in the writer's estimation, that the points both

above and below the defect be fairly well filled.

In the case of ulceration of the lower part of the

caecum however, it is impossible to have these

desiderata, and in this position one may rely on

the constant irregular outline of the lower end of

the barium column.   Normally the lower end of the

caecum filled with barium presents a regular, well
rounded extremity;   if this is replaced by one of
persistently irregular or pointed outline,
particularly if it is in a high position, one is
justified in diagnosing ulceration.

The Transverse Colon being more horizontal than the
previous section is more easily emptied;   the
opaque column is therefore frequently broken up
even under normal conditions, although one or more
observations usually show it complete and well
segmented.   In the absence however of any
indication of ulceration in the caecum and
ascending colon, great consistency of the filling
defect is required in order to substantiate a
diagnosis of ulceration of the transverse colon.

The Descending Colon - Although this part of the colon
frequently shows a continuous, well segmented
column of barium, yet the movement of its contents
is often rapid and irregular so that, as in the
case of the ileum, ulceration cannot be diagnosed
from a direct examination.

Brown and Sampson lay much stress on localised and
generalised hypermotility of both large and small
intestines as a sign of the presence of ulceration;[15]
they suggest that there frequently occurs in both

divisions of the intestines, a mass movement of the
opaque substance from the site of ulceration,
instituted apparently by palpation of the abdomen
during screening producing irritation of the
ulcerated area. The writer frequently noticed
this phenomenon in the small intestine, but on only

Sketch 2.

one occasion did he see it in the large bowel - in
this case a large mass of barium moved from the
upper part of the ascending colon, throughout the
transverse colon, to come to rest in the upper part
of the descending colon. Here, the ulceration of
the ascending colon was probably extensive, but it
could not be determined that there was ulceration
of the transverse colon, as a small quantity of
barium was still present in the transverse colon at
27 hours, although none was ever seen there in the
previous examinations.

With regard to the generalised
hypermotility, the writer has not found it of great
assistance in the diagnosis of ulceration. In all,
60 cases of pulmonary tuberculosis, and one case
where tuberculosis was not present, were examined
by the radiological method. Of these, 58 cases
were divided into 3 main classes, while 2 cases for

different reasons were not so classified.

Class A comprised those cases in which ulceration
was demonstrated by both the radiological method
and by the presence of occult blood in the faeces,
and may be considered as definitely showing
ulceration.   There were 15 cases in this group.
In class B were 19 cases where radiography was
negative with regard to ulceration, but where a
positive benzidine test was obtained from the
faeces.   In these, it may be considered that
ulceration was probably present.   Included in this
group are a certain number of cases where, in the
writer's view, the radiological findings are
doubtful - it is probable that an observer of
greater experience, or one who had opportunity for
post-mortem or operative verification, would not
hesitate to diagnose intestinal ulceration in such
cases on radiological evidence alone.

Class C was composed of 24 cases which gave
negative results both with the X-Ray and benzidine
methods, and were consequently regarded as being
free from ulceration.

Taking first the degree of evacuation of the meal
at 27 hours, the following table gives the numbers

in the respective classes in which the evacuation
was complete.

Class
  A (R+,B+) Complete evacuation 4 out of 15 cases.
                at 27 hours

  B (R-,B+) -   -   -   -   -   1 out of 19 cases.

  C (R-,B-) -   -   -   -   -   4 out of 24 cases.

Thus, although the cases of frank ulceration show the
largest proportion of complete evacuation within 27
hours, yet that proportion is not sufficiently large
to warrant great importance being attached to it as
a diagnostic sign;   particularly so when 4 of the
24 definitely negative cases also showed complete
evacuation.

        Since direct observation of the passage of
the barium meal through the small intestine is so
difficult and uninstructive, it was thought that some
indirect information might be obtained from a study
of the times required to empty the stomach and small
intestine.   It might have been expected that the
presence of irritant ulcers in the ileum would
reflexly cause a delay in emptying of the stomach,
and also a rapid passage of the meal through the
ulcerated intestine, but, although such conditions
were present in some instances, they were not found
to be constant.

Class
A (R+,B+) Stomach empty by   10 out of 15 cases.
                6th hour.

B (R-,B+)   -   -   -   -   9 out of 19 cases.

C (R-,B-)   -   -   -   -   12 out of 24 cases.

From the above table it may be seen that there was, indeed, a smaller proportion of class A cases in which delay in the stomach beyond the sixth hour was noticed, than in the B and C groups. This was contrary to theoretical expectations, and it is obvious that the duration of gastric retention of the meal is no guide to ulceration of the ileum.

Again, it was thought that the presence of small intestine ulceration might cause some pronounced variation in the time taken for the actual passage of the meal through the intestine. The following table was compiled by estimating in each case the time that elapsed after the stomach was first noticed to be empty, until the ileum was also noticed to be empty.

Class A (R+,B+) "Delay" in small intestine $3\frac{3}{4}$ hours

- B (R-,B+)   -   -   -   -   -   4 hours

- C (R-,B-)   -   -   -   -   - $3\frac{3}{4}$ hours.

The average times of each class being within quarter of an hour of each other, shows that there is no appreciable differences in the times required for the passage of barium through the ulcerated and non-ulcerated small intestine.

Having studied these points the writer is of opinion that, although there may be in many cases a generalised and localised hypermotility of the intestines due to ulceration, it is not sufficiently constant to constitute evidence of ulceration. It may, however, be taken into account as contributory evidence in a doubtful case. He is also of opinion that it is impossible in any manner to diagnose small intestine ulceration by radiological methods alone.

In only two cases was it possible to compare the results of the barium meal examination with post-mortem findings. In one of these, which at autopsy *Sketch 3.* was found to be free from ulceration, the X-Ray findings were also definitely negative. The caecum and ascending and transverse colons showed an uninterrupted, haustrated column of barium with a regular clear outline for several hours, while a small quantity of opaque substance was still present in the transverse and descending colons at 26 hours.

The second case was *Sketch 4* found at autopsy to have extensive ulceration of the small intestine - upwards of 50 ulcers throughout the jejunum and ileum. The caecum was extensively ulcerated, there was a large ulcer (1" x 2") at the hepatic flexure, and a similar ulcer in the transverse colon. Radioscopy showed

absence of barium from the caecum and hepatic flexure
at every view, while the transverse colon was well and
completely outlined in only one observation.   On four
occasions a column of barium was seen in the ascending
colon,which ended below in an irregular pointed
extremity while its upper end was also irregular.
Most of the meal had been evacuated by the tenth hour,
a small quantity being present in the descending colon
with traces in the transverse colon.   At the twenty
fifth hour a remnant was still visible in the lower
sigmoid.   It is thus obvious that the radioscopic
findings closely correspond with those observed post
mortem.

Since some of the 61 cases examined
radiologically were selected, the figures obtained
cannot be used for statistical comparisons,but must be
taken in conjunction with the results of the benzidine
test.   It will be convenient to describe at this
point the technique used in application of that test.

The Benzidine Test for Occult Blood.

The examination of the faeces for the
presence of occult blood has been used for many years
as an aid towards the diagnosis of intestinal
ulceration.   Considering the relative simplicity of
the tests,and the preponderance of evidence for the

fact that a positive result, at least, is accurate, it
is remarkable that they are not more widely used as a
means of diagnosis.   Joachim (16), as early as 1904,
found that no case where ulceration was absent gave a
positive result for occult blood.

Landis (17),using the benzidine test,and correlating
his results with post-mortem findings,obtained
negative tests in all his non-ulcerated cases, while
rather more than half of his ulcerated cases gave
positive results.

Sahlgren (18), also preferring the benzidine test,
performed autopsies on 41 cases whose faeces he had
tested;   of these,one showed no ulceration and gave a
persistently negative result to the benzidine test,
while four fifths of his ulcerated cases showed a
positive result.

Loll (19) likewise obtained a negative result from the
benzidine test in non-ulcerated cases, and considers
that cases of ulceration show a positive reaction.

Ogilvie (20) also affirms the value of a positive
benzidine test, and deprecates the necessity for a
strict diet and exclusion of iron, stipulating only
that red bone-marrow should be inhibited.   His
remarks,however, refer to the test as described by
Gregersen,which makes use of a dilute solution of

benzidine and is otherwise probably not so sensitive
as that used by the writer.   These observers all
affirm the value of a positive finding of occult
blood in the faeces as indicating the presence of
intestinal ulceration, and the greatest criticism
offered by anyone appears to be that a negative result
does not exclude ulceration.   At the same time they
urge that the presence of occult blood in the faeces
is of more frequent occurrence than symptoms of
ulceration, which enhances the value of the test,
and in the opinion of the writer it is indeed more
frequent than indisputable X-Ray evidence of the
disease.

The technique used by the writer was as
follows.   The patient's medicine-list was revised,
and iron- and iodine-containing drugs were excluded.
He was asked to report even the smallest haemorrhage
noticed in the nose or mouth, with particular
reference to the bleeding of gums after the teeth
were brushed, and haemoptysis or blood-stained sputum.
Observation of the sputum was also made independently.
Cases complaining of, or showing haemorrhoids were
rejected.   The parts of the diet containing meat in
any form, and green vegetables were excluded.   Eggs
and white fish were allowed.   This diet was enforced

for three days and specimens of the faeces passed on
the fourth and in some cases on succeeding mornings
were taken.

A sample about a cubic half inch in size
was taken, as far as possible, from the central portions
of the specimen.   This was triturated with 5 c.c. of
ether, 5 c.c. of glacial acetic acid and 5 c.c. of
absolute alcohol, and the result filtered.   A "knife-
point" of benzidine was dissolved in 2 c.c. of
absolute alcohol, care being taken to ensure
saturation of the solution, and to this were added
2 c.c. of hydrogen peroxide (20 vols.), and 2 drops of
glacial acetic acid.

A small quantity of the faecal filtrate was
poured on a fresh clean filter paper, and a few drops
of the benzidine solution added to the moist part of
the filter paper.

A blue colour appearing in the paper within
about 30 seconds was regarded as showing a positive
result, while faint traces of blue colour appearing
after longer periods were considered negative.

On each occasion the reagents used, were
tested against each other in the absence of faeces
and no blue colour was ever observed.   As a further
control, specimens of sputum of various types

including some which were markedly purulent,were,

after thorough solution in alkali, tested in the same

manner as the faeces.   In some cases it was found

that a very faint and rather dubious blue colour

appeared,but only after several minutes exposure to

the benzidine solution.   It was quite impossible to

mistake this reaction for the immediate distinct blue

colour demanded for a positive result to the test, and

when one considers how expert the tuberculous patient

becomes in expectoration, there must be but a

comparatively small quantity of sputum swallowed,which

becomes negligible in the passage through the

alimentary tract and admixture with the considerable

bulk of the excreta.   The benzidine test was carried

out in 200 cases of Pulmonary Tuberculosis, and in 97

of these it was found to be negative, while in 103 it

was found to be positive.   All cases were treated

alike, with rigid observance of the above technique.

Since 97 of them gave negative results it must be

allowed that precautions were adequate as regards food

and medicine taken, and that no extraneous blood was

allowed access to the specimens.   It follows that the

blood was derived from some point between the upper

end of the oesophagus and the anus.   No cases showing

any complications were included, so far as is known,

so that it may be concluded that any blood, present in
the specimen was derived from tuberculous ulceration
of the intestine.

Further, 4 cases admitted to the hospital
under observation, none of which ever showed tubercle
bacilli in the sputum, and which were decided to be
non-tuberculous, were each found to give negative
reactions, whereas one case where rectal carcinoma was
diagnosed gave a positive benzidine reaction..

It is realised that the best means of
proving the results of a test is by correlation of
these with autopsy findings. Unfortunately this has
been impossible except in seven cases since it is the
policy of the hospital in which this work was carried
out that cases which are unlikely to improve be
transferred to general hospitals. These seven cases
are however of interest in that the results of the
benzidine test correspond with the findings at autopsy.

In one case, in which no ulceration was
found post-mortem, the benzidine test was negative.
In three cases where ulceration was extensive, occult
blood was present in the faeces. One of these is of
particular interest in that while 13 ulcers were
found in the ileum there was no ulceration in the
large intestine, so that diagnosis of ulceration by

radiological methods would have been improbable and,

in so far as the writer is concerned, impossible.

The three remaining cases, while yielding

negative results to the benzidine test, were yet found

to be ulcerated, although in each case to a very

limited extent.   In each case there was one ulcer in

the ileum and one in the caecum;   in two of the cases

each ulcer was small - not more than 1/4" in diameter;

in the third case the ulcers were larger - being about

1" in diameter.   Brown and Sampson are doubtful are

doubtful as to what extent ulceration must have

proceeded in order to be apparent by radiography, but

seem to consider that three or four small ulcers are

necessary,[21] so that it is conceivable that the latter

form of investigation would have been no more

successful in demonstrating the smaller ulcers than

was the occult blood test.

As was previously mentioned, 60 cases of

pulmonary tuberculosis were examined by means of

radioscopy of the barium meal.   Of these 15 were

found to show ulceration of the intestine, and in all

these cases occult blood was found in the faeces.

24 of them showed no indication of ulceration, and the

benzidine test of the faeces was negative in all these

cases.   19 of the remainder yielded positive

benzidine tests while X-Ray evidence of ulceration was

either wanting or equivocal.   In one case only was   *Sketch 5.*

there definite radiological evidence of ulceration,

while the benzidine test was negative on six occasions.

The remaining case was definitely non-ulcerated when

examined radiologically, but no occult blood test was

carried out.

Since the cases showing occult blood were in

excess of those showing X-Ray evidence of ulceration,

these findings cannot be used to prove the correctness

of the benzidine test in the diagnosis of intestinal

ulceration.   At the same time it is remarkable that

with the exception of the one anomalous case noted,

all the cases giving radiological evidence of

ulceration should give a positive benzidine test,

while, with the same exception, all the cases proving

negative by the latter form of investigation should

also prove negative by the former.   Further, in the

intermediate group, are included several cases

concerning whose radiological evidence the writer was

doubtful, but which a more experienced observer might

have considered to show ulceration.   In this group

are also included several cases which symptomatically

suggested ulceration, but in which radiological

examination was negative.

The results of the two methods of examination are therefore comparable, while the occult blood test shows the presence of ulceration in a greater proportion of cases than does the X-Ray diagnostic method.   It is suggested by the writer that in diagnosis the functions of the two methods are complementory and confirmatory, the benzidine test being used to confirm or negative a doubtful radiological diagnosis;   or if facilities permit, the benzidine test should be used as a routine examination in all cases of pulmonary tuberculosis, and a confirmatory X-Ray investigation carried out in those cases which are found to be positive to the occult blood test.

For the purpose of a statistical investigation, the benzidine test has been chosen on account of its facility in application to large numbers of patients, and also, in the writer's opinion, its greater delicacy.

The hospital at which these investigations were carried out is an institution of the London County Council, and the patients, males only, are drawn from all the London Boroughs.   It is not a hospital for advanced disease, its main object being the treatment of those cases of pulmonary tuberculosis

where there is indication for special treatment such
as artificial pneumothorax, injection of gold salts
or phrenic evulsion, and the after care of cases of
thoracoplasty and tuberculous empyaema.   It also
acts to some extent as a clearing station, suitable
cases being sent to sanatorium, while cases of advanced
disease which are unlikely to react to treatment are
transferred to general hospital.   A large proportion
of the cases are of a type suitable for sanatorium,
and are undergoing treatment by Paterson's system of
graduated labour.

Pulmonary tuberculosis is consequently
encountered in all its stages, and these stages in
proportions comparable, in the writer's estimation, with
proportions found in the community at large.   From
such material were taken, quite indiscriminately, 200
cases and it is considered that they are fairly
representative of pulmonary tuberculosis as a whole,
with perhaps a slight preponderance of the more
advanced cases.   Thus according to the Turban
Gerhardt method of classification there were,

of L.1 cases   -   8·5%,

of L.2 cases   -   23% ,

of L.3 cases   -   68.5%.

In each of these 200 cases, the faeces were examined
by means of the benzidine test for occult blood.

It was found that the test was positive in
103 cases and negative in the remaining 97. The first
fact to emerge then, is that approximately 50% of
cases of pulmonary tuberculosis which are diagnosed
are complicated by intestinal ulceration. This may
seem to be a high figure, but it becomes comprehensible
when it is remembered that at death 80 - 90% of cases
of pulmonary tuberculosis are found to present
intestinal ulceration. It is also borne out by the
fact that Brown and Sampson working with "favourable
and usually early" cases and using radiography as a
means of diagnosis give, out of a total of 5,542 cases
examined, a figure of 26·4% as showing evidence of
intestinal ulceration. [22] They quote Schwatt [23] as stating
that "25% of far-advanced cases present definite
symptoms of tuberculous enteritis" and appear to
consider such a figure much too low and point out that
he was judging by means of symptoms alone.   It
cannot be too strongly urged, in the writer's opinion,
that symptoms indicative of intestinal disease must
not be expected in cases of tuberculous ulceration of
the intestine; even in cases where ulceration is
extensive symptoms may not be present.   It is

admitted that alimentary disturbances such as anorexia, a feeling of gastric distention, and flatulent indigestion are very common, but they are common in all toxaemic cases whether the intestines are ulcerated or not.   They do not point directly to an intestinal lesion, and he would be a bold man who would diagnose such a condition on their presence alone.   Suggestive symptoms such as colicky abdominal pain, diarrhoea, or constipation alternating with diarrhoea, are comparatively rare, and their presence demands further investigation by means of the barium meal or the occult blood test.   Their occurrence in a case of pulmonary tuberculosis is not, of course, diagnostic of intestinal ulceration since they may be caused by such factors as aperients and unsuitable food.

In only 6 out of the 15 cases of ulceration diagnosed by both radiological and occult blood methods, were symptoms referable to the intestine noticed, and in only 25% of the cases deemed ulcerated on account of a positive benzidine test were they present.   At the same time 8% of non-ulcerated cases complained of symptoms referable to the intestine.

Of the 103 cases which the writer found to have ulceration ,

  2·9%   were · L.1)

  25·2%   were   L.2)   Turban-Gerhardt.

  71·9%   were   L.3)

It will be noticed that most of the cases are in the "advanced" group, this is however somewhat misleading as it is the largest group. Thus:-

  of L.1 cases   -   17·7% were   +ve,

  "   L.2 cases   -   56·5% were   +ve,

  "   L.3 cases   -   54%   were   +ve.

No reliance can ,however, be placed upon the percentage in at least the L.1 and L.2 groups, as in these the total number of cases was relatively small.

A study of what Sir Robert Philip calls the S-factor i.e. the factor of systemic intoxication, did not reveal much. Thus, of those cases which showed a pronounced S-factor, 60% had ulceration while only 43% of those in which intoxication was not marked were ulcerated; which would seem to indicate, as one would expect, that the presence of ulceration assisted in the production of the toxaemia.

In each of the cases examined, an estimation of the duration of the pulmonary tuberculosis was made, judging from the first onset

of symptoms referable to pulmonary tuberculosis or which later led to a diagnosis of the disease. It was found that exactly 100 of the cases were examined by the benzidine test within 1 year of onset of pulmonary tuberculosis so judged, and 55 of that 100 cases were found to give a positive test. Although it cannot be said that these were "early" cases in the generally accepted meaning of the term, some of them having indeed reached an advanced stage within a few months, yet it helps to refute the theory that intestinal ulceration is a terminal or subterminal complication of pulmonary tuberculosis. Unfortunately the percentage of cases of ulceration in succeeding years of the disease cannot be given, as the numbers are too small. They would seem to indicate, however, that there was a fall in the percentage in the second year with an increase in the succeeding years.

Since tubercle bacilli have been found to be rather more numerous in the sputum, and probably also in the intestines, of cases with pulmonary cavities than in those without, it has been suggested that intestinal tuberculosis may be more frequent in the cases with vomica formation, and that the presence of cavities in the lung may be associated with intestinal ulceration.

In 70 of the writer's cases pulmonary
cavities were demonstrable by radiography, and of
these, 46 were found to have intestinal ulceration
while 24 were not ulcerated. At the same time it
must be noted that in 57 cases where no cavitation
was demonstrated in the lungs, the presence of
ulceration in the intestines was indicated by the
occult blood test.

A somewhat similar relationship was found to
exist between tuberculous laryngitis and intestinal
ulceration. 31 of the cases studied were
complicated by definite tuberculous laryngitis, and
of these 23 showed evidence of ulceration, while
only 8 did not. It will be recalled that in each
of 9 cases with laryngeal tuberculosis which came to
autopsy, intestinal ulceration was also present.
It may be deduced therefore, that in cases which show
the formation of cavities in the lungs, or laryngeal
tuberculosis, intestinal ulceration is more likely
to be found than in cases not so complicated.

Conclusions

Having carried out and reviewed the results of these investigations the writer is of opinion,

(1) that secondary ulceration of the intestines is present in approximately half of all diagnosed cases of pulmonary tuberculosis - a proportion which increase to 80 - 90% before death.

(2) that it is not essentially a terminal condition, but usually appears when the pulmonary lesion has advanced to a moderate extent.

(3) that within one year from the first appearance of symptoms of pulmonary tuberculosis, secondary tuberculous intestinal ulceration has occurred in approximately half of the cases.

(4) that it does not show its presence by means of symptoms until it has become extensive, and may indeed be found at autopsy in an advanced degree when there were no symptoms indicative of it during life.

The investigator has also drawn the following minor conclusions, —

(5) that, when the necessary precautions have been taken, and in the absence of other ulceration of the alimentary tract, a positive result obtained from the application of the benzidine test to the faeces of a patient suffering from pulmonary tuberculosis, is diagnostic of tuberculous ulceration of the intestine.

(6) that it is possible to diagnose intestinal ulceration by means of the benzidine test, in a greater number of cases than by means of symptoms and clinical examination, or by radiological methods.

(7) that it is impossible, by means of radiological methods at present available, to diagnose tuberculous intestinal ulceration where the small intestine alone is affected, but that the presence of occult blood in the faeces of such cases together with negative radiological findings in the large intestine is, in the absence of symptoms, the only method of diagnosis of such a condition.

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Barium Meal 8 am.
Breakfast 8.15 am.

Barium Meal in a Normal
Non-Tuberculous Subject

11.20 am.

St.

A.C.

Caecum

12.40 am.

? small intestine or D.C.

Small intestine.

Dinner 1 p.m.

2.30 pm.

TC

DC

Cae.

S.I.

4.00 pm.

Cae.

S.I.

Lower sigmoid superimposed upon Caecum.

Tea 4.15 pm.
Bowels opened.

Supper. 6.30 pm.

5.35 pm.

7.15 pm.

TC.

Bowels not opened.

10.30 am.
(26 hours)

Cae.

Sigmoid colon.
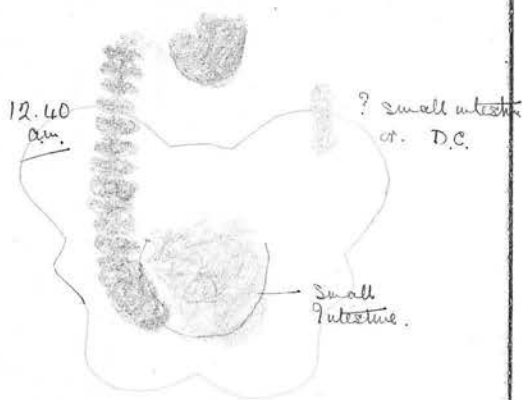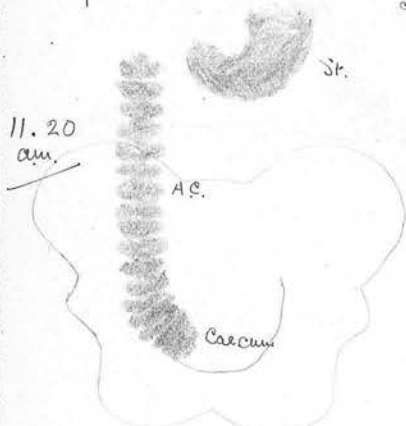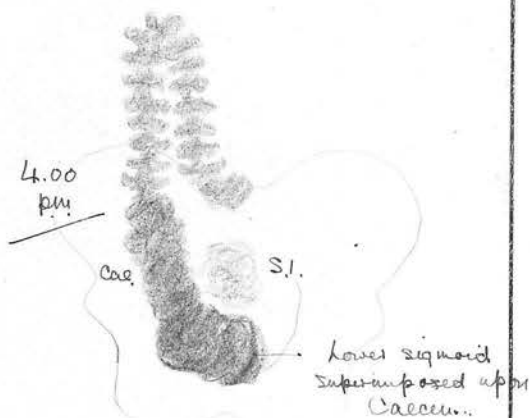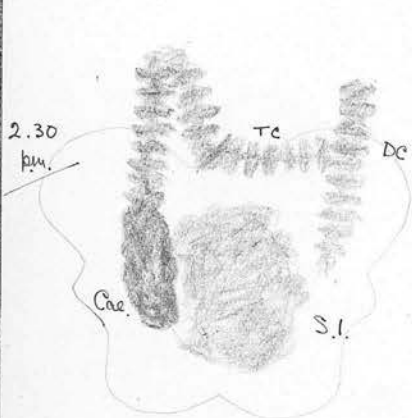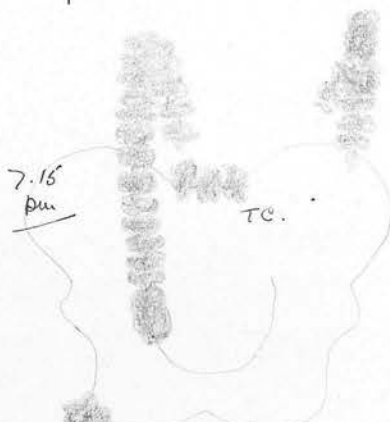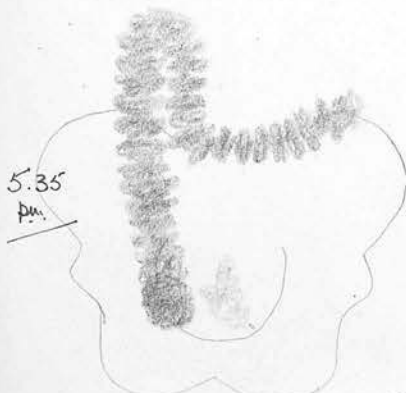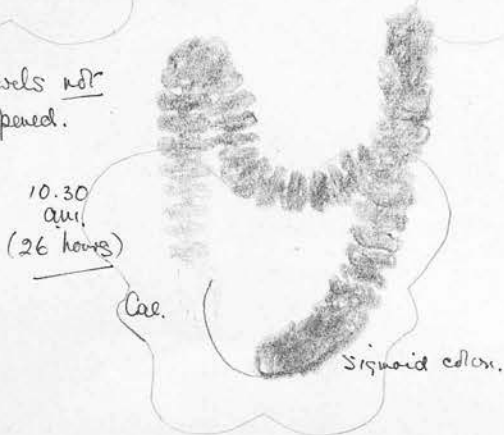
Notes.
Stomach empty 5-7 hours.
Small int. empty 9½ - 11¼ hrs
Greater part of meal left at 26 hrs
Caecum and colon well filled throughout
No filling defects.

Barium Meal 7.00 a.m.   2.   Benzidine +
Breakfast   8.15 a.m.   A Radiography +

St.

10.30
a.m.
S.I.

St.

12.30
p.m.
S.I.

Dinner 1.00 p.m.

A.C.

2.30
p.m.
S.I.

4C

4.00
pm
S.I.
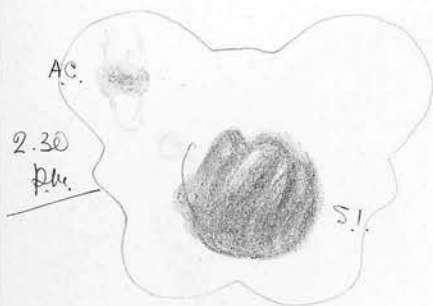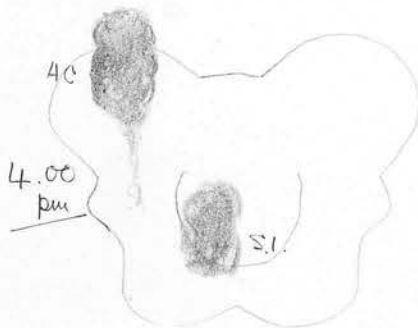
Condition as seen immediately
after preceding one (at 4.00 p.m.).
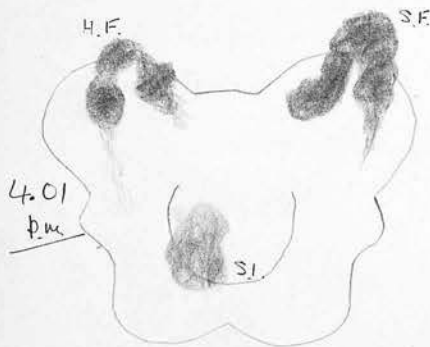
4.F.   S.F.
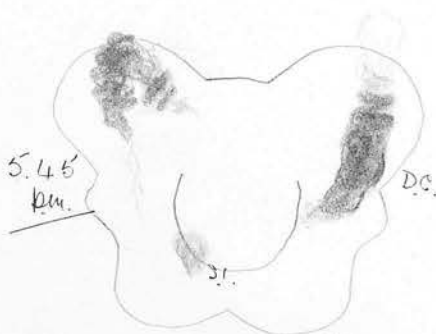
4.01
p.m.
S.I.

5.45
p.m.
D.C.
S.I.

Bowels opened.

T.C.
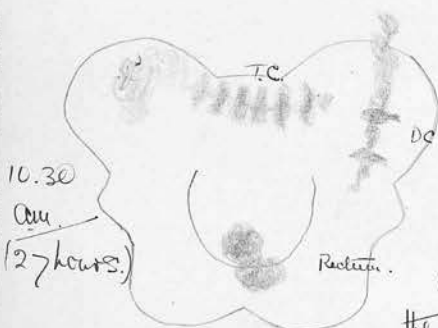
10.30
a.m.
(27 hours.)
D.C.
Rectum.

Stomach empty 5½ – 7½ hours.
Small intestine not empty at 10¾ hrs.
Small quantity of barium still present
at 27 hours.
Caecum and lower ascending colon
never filled with barium.
N.B. At 4 p.m. a large quantity of barium
was noticed in upper ascending colon.
On palpation a contraction commenced in
the colon and about half of the mass
was separated and travelled at quite a noticeable
speed along the transverse colon. It ultimately came to rest
in the region of the splenic flexure

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Breakfast 8.15 am.
Barium 9.00 am.

3.

Radiography —
Autopsy —

10.30
am.

Tonic
St.

12.15
pm.

St.

S.I.

No Dinner

Tea 4.30 pm.

2.15
pm.

S.I.

5.15
pm.

TC
AC

Cae.

S.I.

Supper. 6.30. pm.

7.00
pm.

8.00
pm.

11.00
am.

26 hours.

TC

DC.
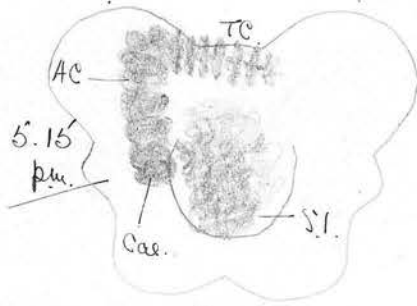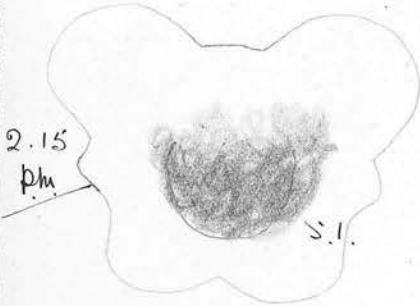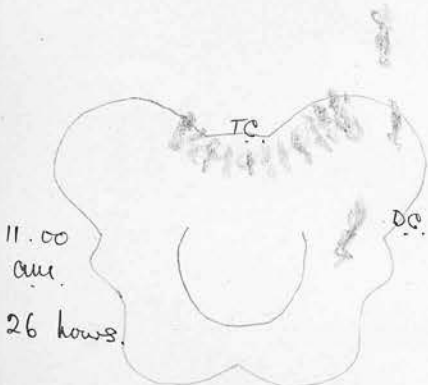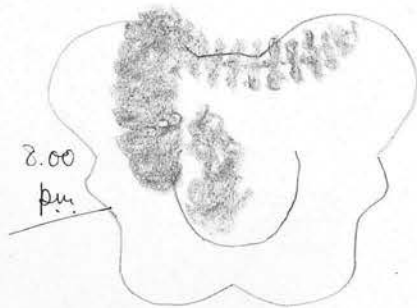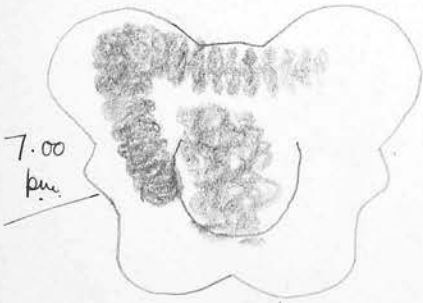
Stomach empty 3-5 hours.
S.I. not empty at 11 hours.
Small part of meal left at 26 hours.
No filling defect
No evidence of ulceration
— Confirmed at autopsy

176.

Breakfast 8.15 am.
Barium 9.00 am.

4.
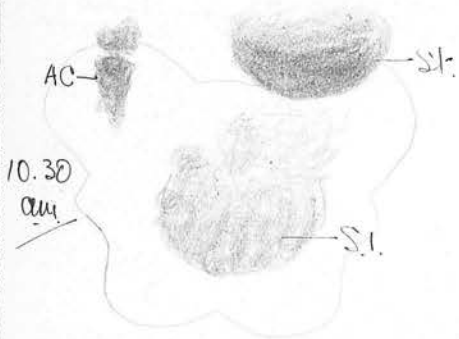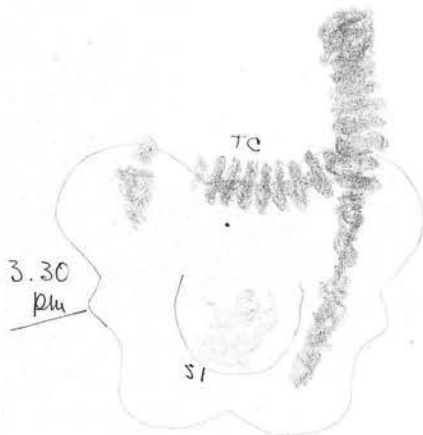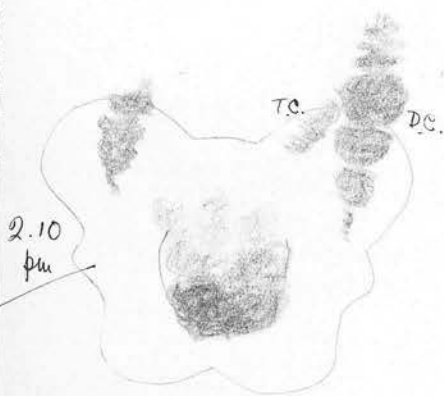
A Benzidine +
Radiography +
Autopsy +

AC —
— S.I.
10.30 am
— S.I.

A.C. —
12.00 Noon

Dinner 1.00 p.m.

T.C. — D.C.
2.10 pm

T.C.
3.30 pm
S.I.

Tea 4.30 p.m.

— Gas.
T.C.
AC
5.00 pm.

Supper. 6.15 pm.
Bowels opened.

— Gas.
A.C.
6.45 pm.

Bowels opened.

10.30 am
(25 hours)
Sigmoid or. Rectum.
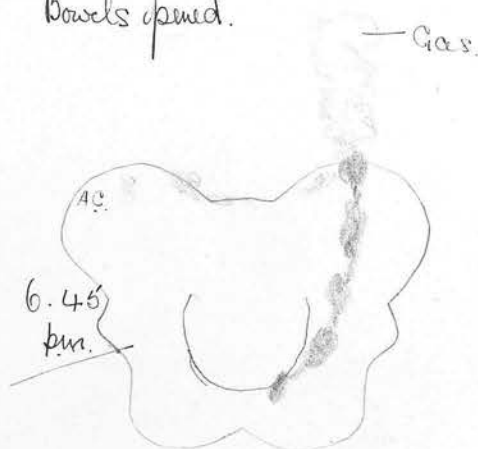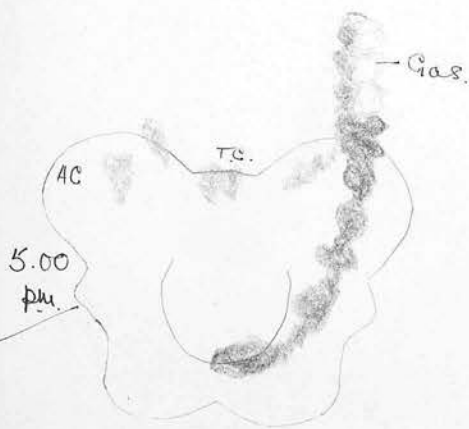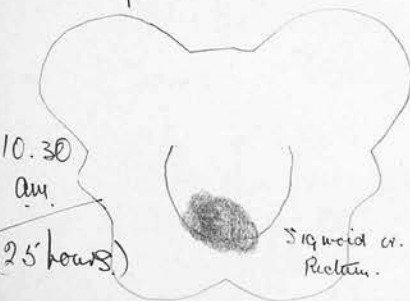
Stomach empty 3-6 hours.
Small intestine empty. 6-8 hours.
Small portion of meal left at 25 hours.
Caecum, Hepatic Flexure and first part of
Transverse Colon never filled c̄ barium
at Autopsy Extensive ulceration in
Small intestine and caecum, one ulcer
at Hepatic flexure and one in
Transverse Colon.

150.

Barium Meal 7.00 a.m.   5.   Benzidine —
Breakfast.   8.15. a.m.   Radiography +
                       "Anomalous Case" (referred to
                       in thesis.
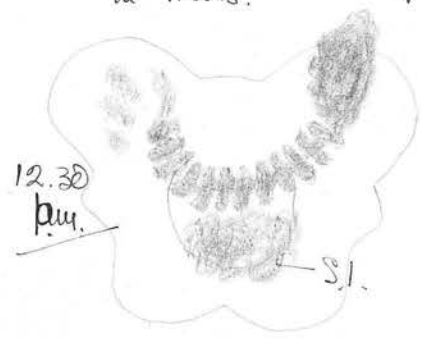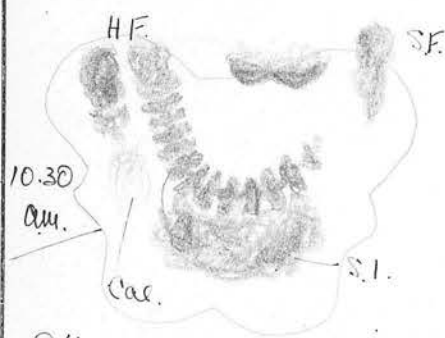
HF.   SF.

10.30 a.m.

Cæc.   S.I.

12.30 p.m.

S.I.

Dinner 1.00 pm
Bowels opened.

2.30 p.m.

Sigmoid Colon.

4.00 p.m.

T.C.

Rectum.

Tea 4.30 pm

5.45 p.m.

T.C.

Sigmoid

10.30 a.m.
(27 hrs)
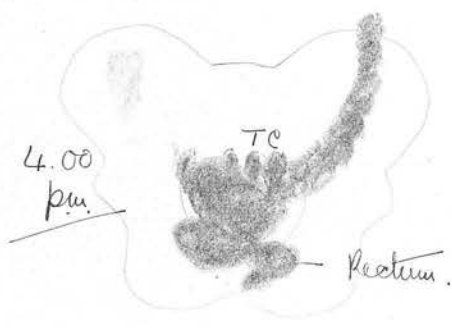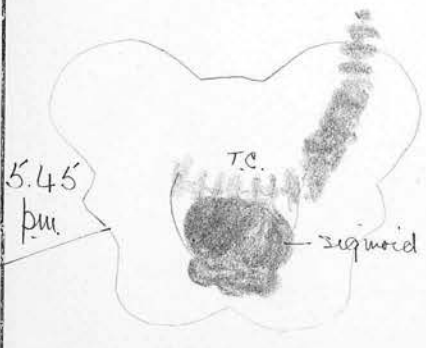
Stomach empty 3½ - 5½ hrs.   Small Intestine empty 5½ - 7½ hrs.
Practically entire meal left at 27 hours

General hypermotility is present the meal having reached
the Splenic Flexure within 3½ hours and the Sigmoid Colon
in 7½ hours. Sigmoid and Rectum show stasis retaining
the meal for over 20 hours.

The cæcum and ascending colon (lower part) were never seen
filled although in the first two views Barium had passed through
them & was still present in ileum. A diagnosis of ulceration
is therefore justified although Benzidine repeatedly negative (6 times)
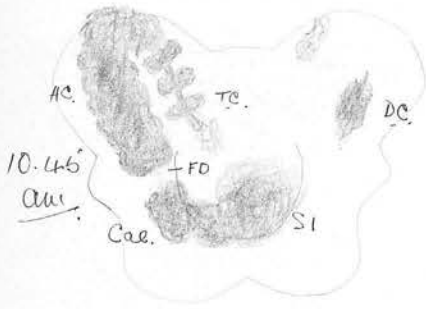
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Barium meal 7.00 am.
Breakfast 8.15 am.

A Benzidine +
Radiography +

AC. TC. DC.
10.45 am. FD
Cae. S1

12.45 pm. FD

Dinner 1.00 pm.

Tea 4.15 pm.

i as in S.F.
F.D.
DC.
2.30 pm FD
Cae

F.O.
5.00 pm FD
Cae Sigmoid
S1

Supper. 6.30 pm

F.O.
6.45 pm. F.O.
Cae Sigmoid

F.O.
8.00 pm F.O.
Cae Sigmoid

Bowels opened.

10.45 am.
(27 hours)
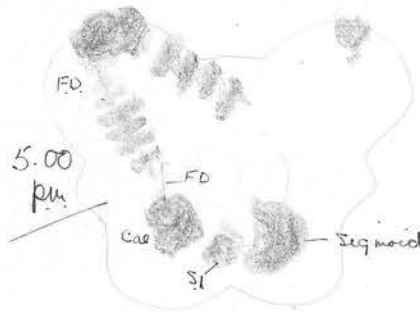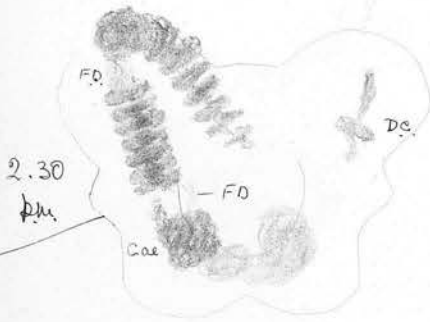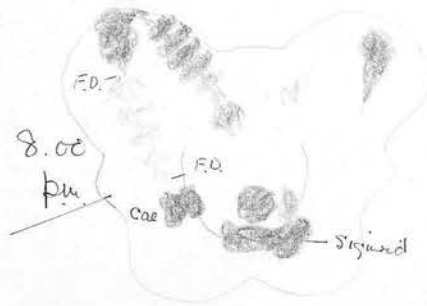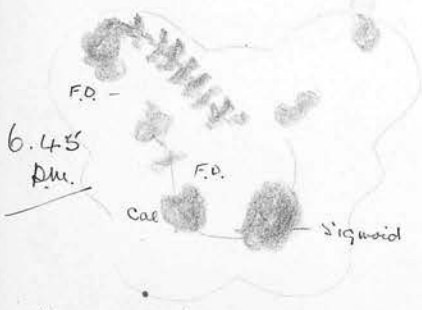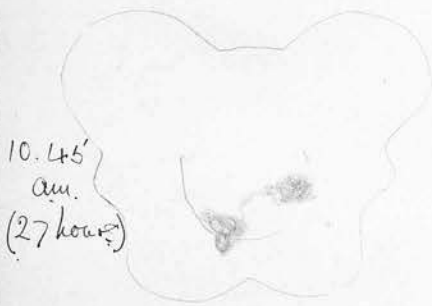
Stomach empty by 4th hour. when
meal as far as descending colon —
gen. hypermotility
Small int. empty by 9 - 11th hours.
Very small part of meal. left at
27 hours.
Constant filling defect at caeco-
colonic junction and doubtful
defect at hepatic flexure.

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Breakfast 8.15 am.
Barium meal 9.00 am.

Benzidine +
Radiography +

10.45
am.

St.
S.I.

12.00
noon.

St.
S.I.

No dinner

2.30
pm.

TC
AC
F.D.
St.
S.I.

3.15
pm.

TC
AC
FD
S.I.

Tea. 4.15 pm.

Supper. 6.30 pm.

5.15
pm.

TC
AC
F.D.
Cae.
S.I.

6.45
pm.

TC
AC
FD
Cae.

8.00
pm.

TC
AC
F.D.
Cae.

Stomach empty 3 - 5½ hours.
Small intestine empty 8¼ - 9¾ hrs.
No meal left at 25 hours.
Constant filling - defect
at caeco-colonic junction —
ulceration at that site
Occasional filling defect at 1st
part of. transverse colon
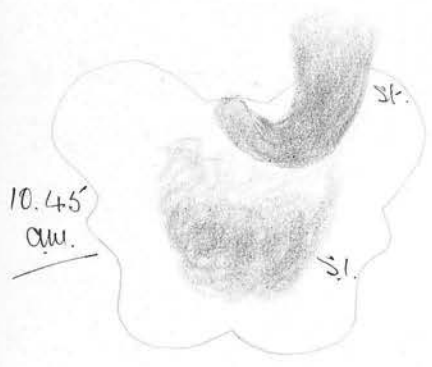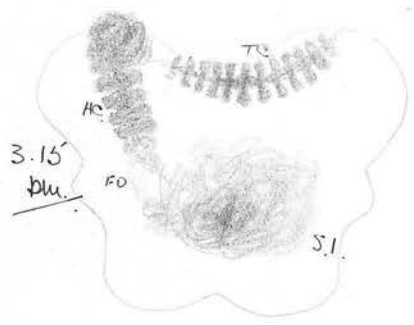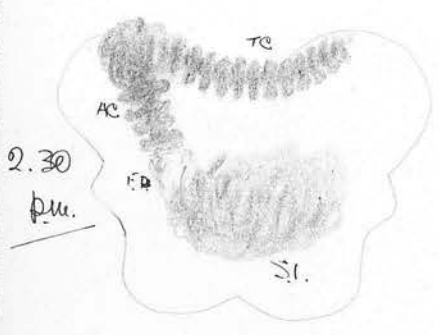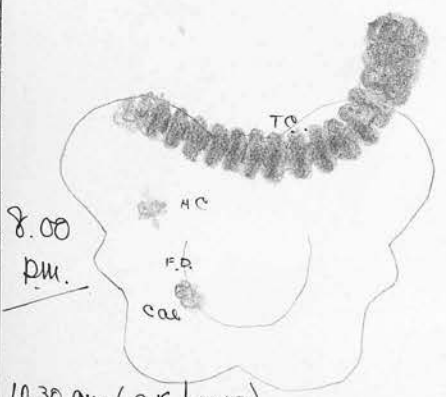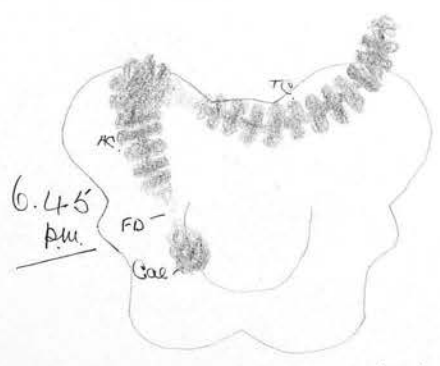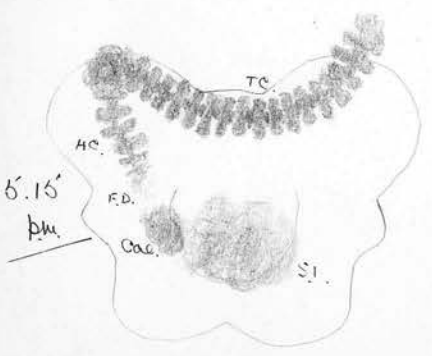
10.30 am (25 hours)
— no Barium left.

Barium Meal 7.00 am.
Breakfast. 8.15 am.

Benzidine +
A. Radiography +

10.45 am

12.45 pm.

Dinner 1.00 p.m.

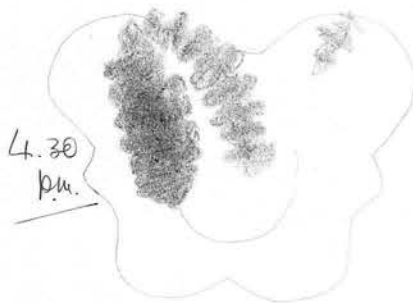Tea 4.15 p.m.

2.30 p.m.

4.45 p.m.

Supper. 6.20 p.m.

6.45 p.m.
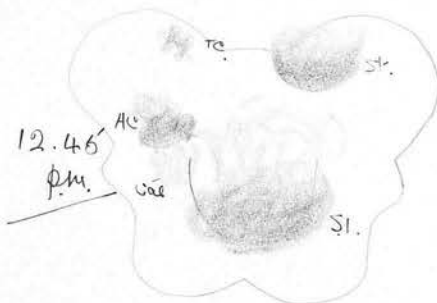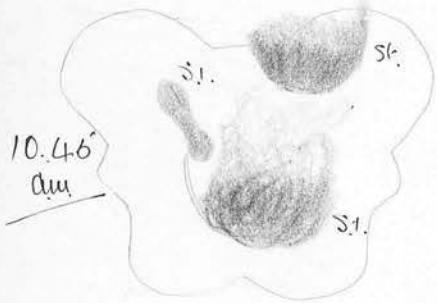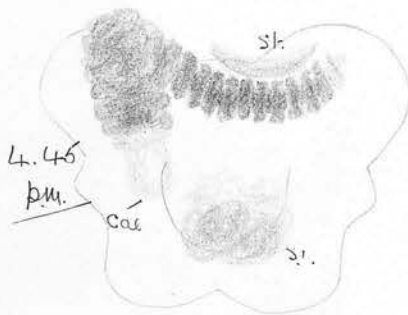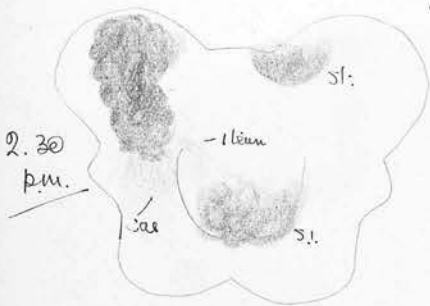
8.00 pm
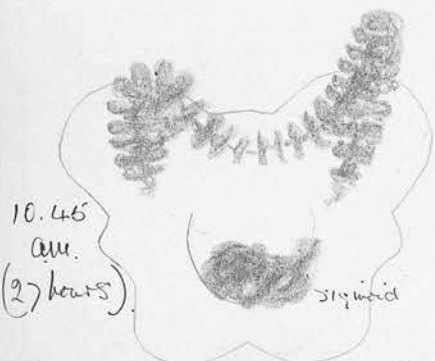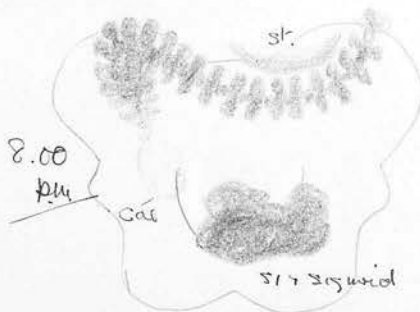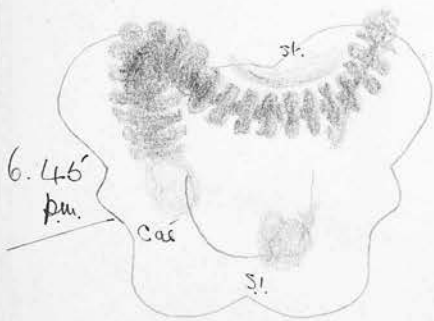
Stomach not empty at 13th hour.
Small intestine not empty at 13th hour.
Caecum seen at most views
but it was never seen well-
filled. — ulceration of caecum

10.45 am.
(27 hours).

Transverse colon still well-filled
at 30 hours.
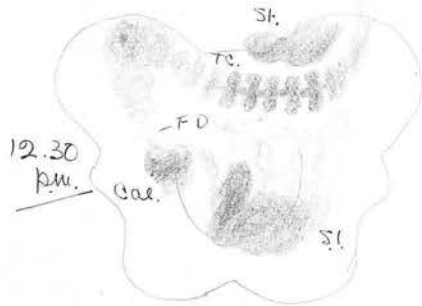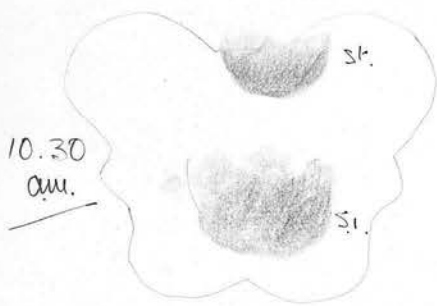
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Barium Meal. 7.00 am.
Breakfast 8.15 am.

A Benzidine +
Radiography +

10.30 am.
St.
St.

12.30 p.m.
St.
TC
FD
Cae.
St.

Dinner 1.00 p.m.
Bowels opened.

Tea. 4.15 p.m.

2.30 p.m.
TC
FD
Cae.
St.

4.30 p.m.
TC
FD
Cae.
Sigmoid

Supper 6.30 p.m.

6.15 p.m.
TC
FD
Cae.
Sigmoid

8.00 p.m.
FD
TC
Cae.
Dc.
Sigmoid
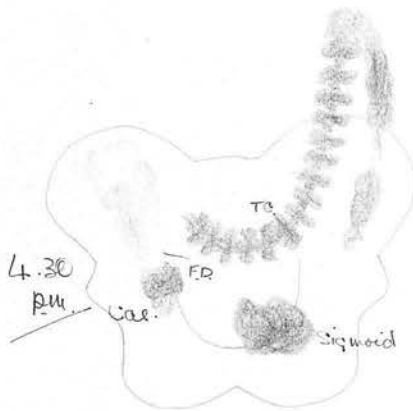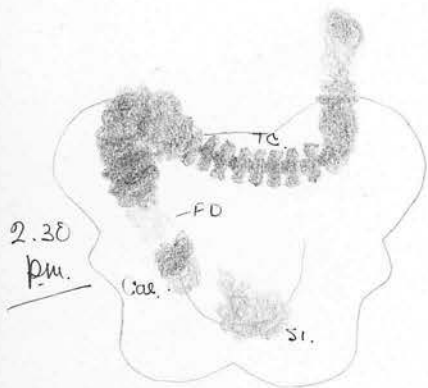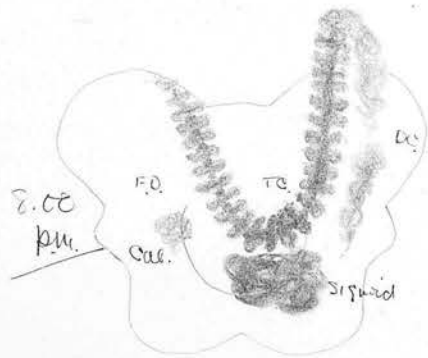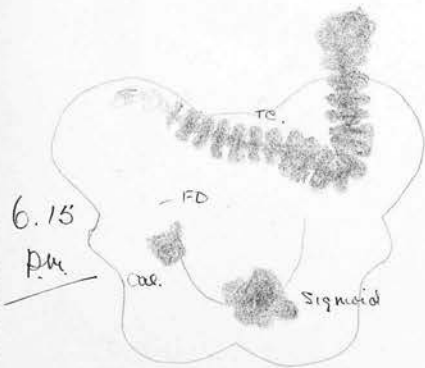
Bowels opened.

Stomach empty 5½-7½ hours.
Small intestine empty 9½-11½ hrs.
Part of meal still remaining at
27 hours.
Constant filling - defect present
at all views at caeco-
colonic junction - ulceration.

10.30 am.
(27 hours)
Cae.

Barium Meal 7.00 am.
Breakfast. 8.15 am.

A Benzidine +
Radiography +

10.30
am.

12.30
pm.
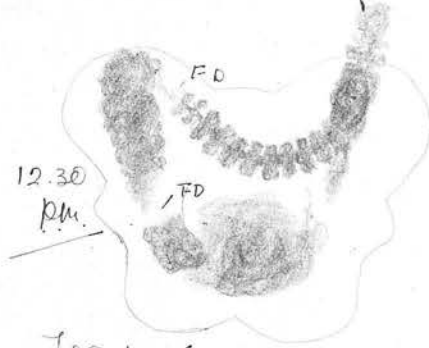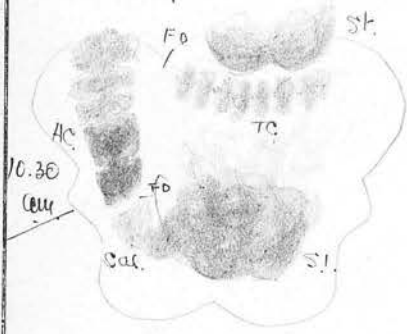
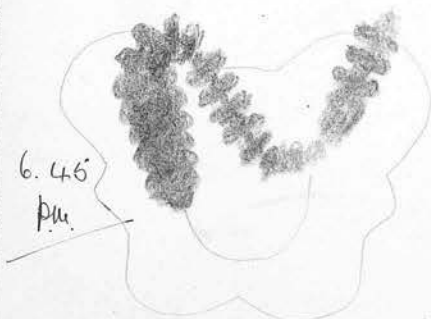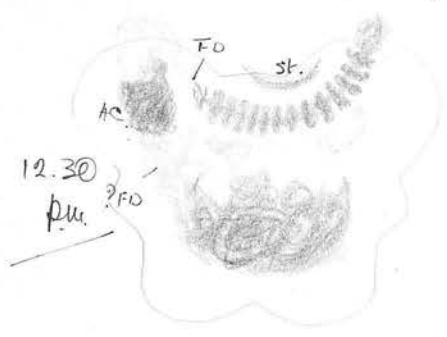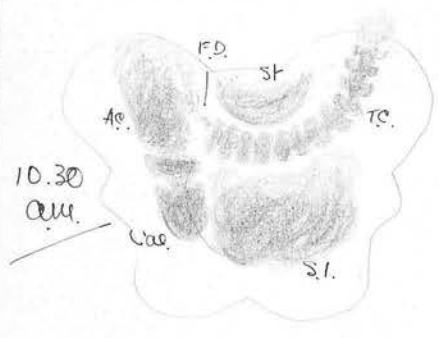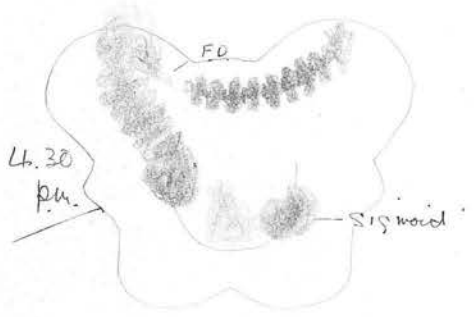Dinner 1.00 pm.

Tea 4.15.
Bowels opened.

2.30
pm.

Sigmoid.

4.30
pm.

Cae.   SI

Dinner 6.30

6.15
pm.

8.00
pm.
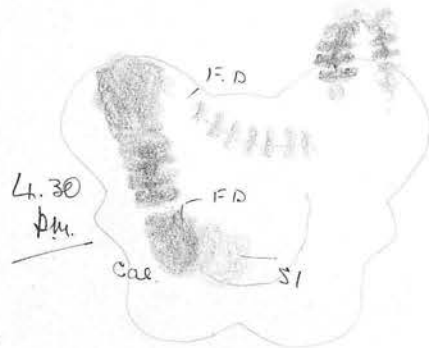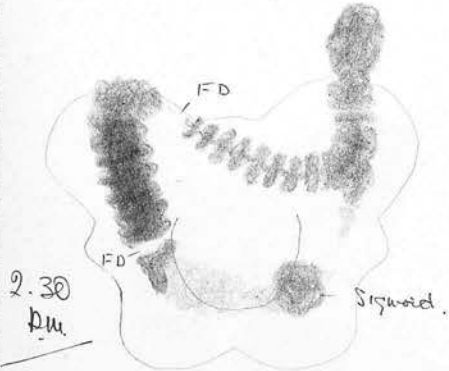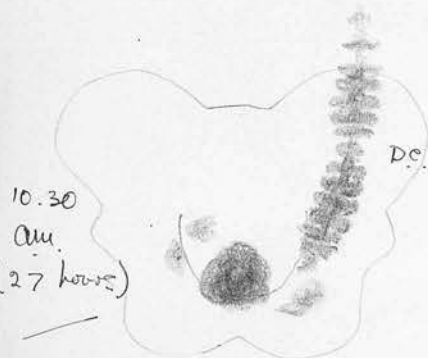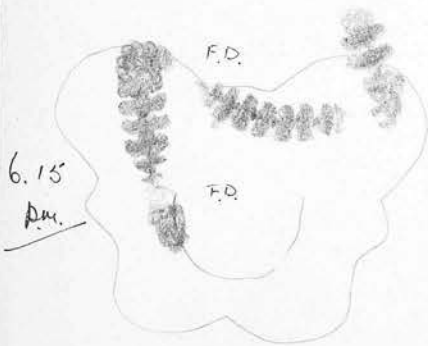
Stomach empty 3½ – 5½ hours.
Small intestine empty 7½ – 9½ hours.
Part of meal in colon at 27 hours.
Constant filling defects
present at caeco-colonic
junction and in first
part of transverse colon.
– ulceration at these points
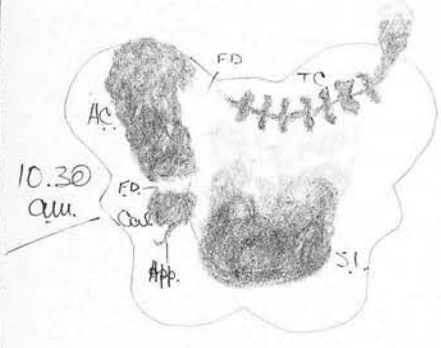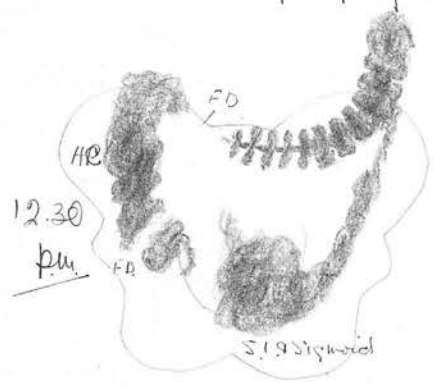
10.30
am.
(27 hours)

185.

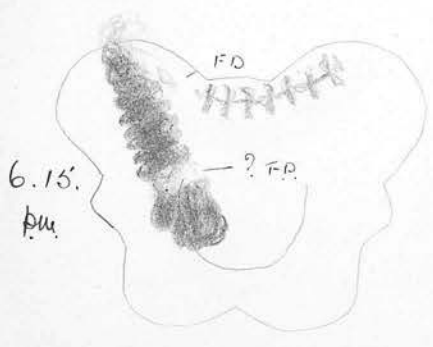Barium Meal 7.00 a.m.
Breakfast 8.15 a.m.

A Benzidine +
Radiography +

10.30
a.m.

AC.
F.D.
T.C.
F.D.
Caed.
App.
S.I.

12.30
p.m.

F.D.
H.P.
F.D.
S.I. & Sigmoid

X-mins 1.00 p.m.

Tea 4.15 p.m.

2.30
p.m.
F.D.

Ileum.
Sigmoid.

4.30
p.m.
F.D.

Bowels opened.

Supper 6.30 p.m.

6.15
p.m.

8.00
p.m.
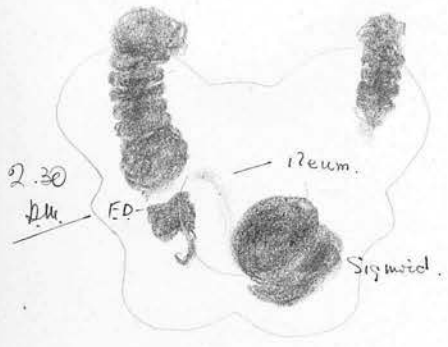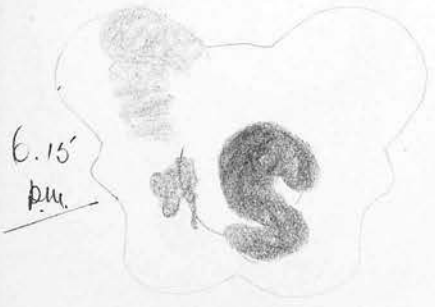
Bowels opened

10.30
a.m.
(27 hours)

Stomach empty at 3½ hours.
Small Intestine 7½ - 9¼ hours.
Part of meal still left at 27 hours.
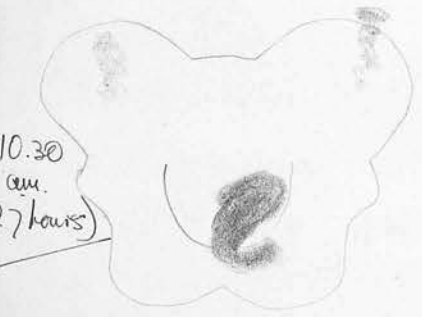
Constant filling - defects at
Caeco-colonic junction and in
first part of transverse colon.
— ulceration in these
sites

153

Barium Meal 8. am
Breakfast 8.15 am.

A Benzidine +
Radiography +

10.30 am.

_St_
_SI._

12.10 pm.

_St_
_SI._

No Dinner

2.10 pm.

HF
FD
TC
DC.
AC.
Cae.
SI.

3.30 pm.

FD
AC.
Cae.

Tea. 4.30 pm.

5.15 pm.

FD
Sigmoid colon.

Supper 6.30 pm.

7.00 pm.
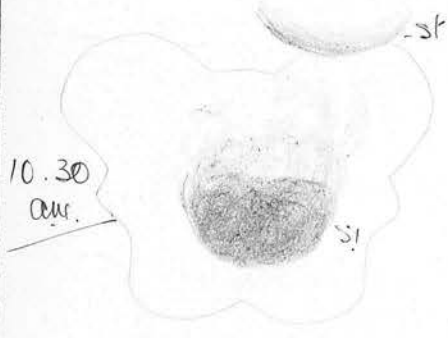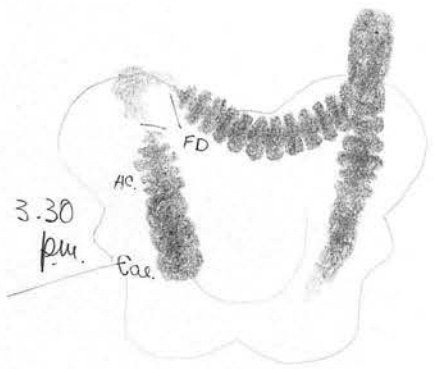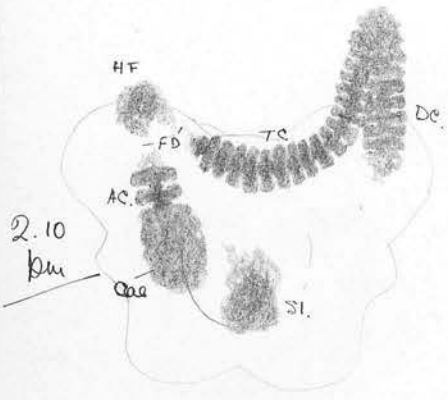
FD
Sigmoid + Rectum
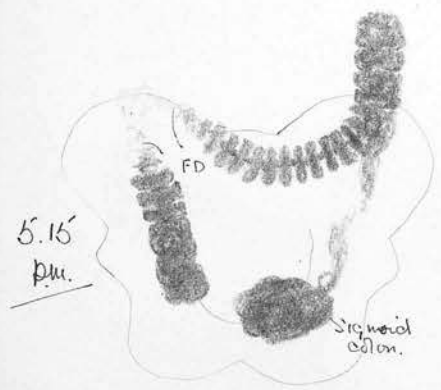
No Barium left in colon at 26 hours.

Stomach empty 4 - 6 hours.

Small intestine empty 6 - 7½ hours.

Constant filling defects present in each of last
4 views at upper end of ascending colon and
in 1st part of transverse colons — ulceration
∴ present in these regions

140.

Breakfast 8.15. am.
Barium Meal 8.45 am.

A   Benzidine +
     Radiography +

10.30 am.

12.45 pm.

No Dinner

2.30 pm.

4.15 pm.
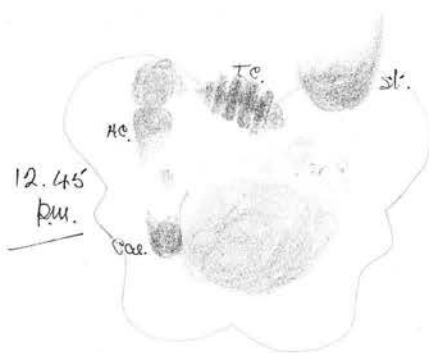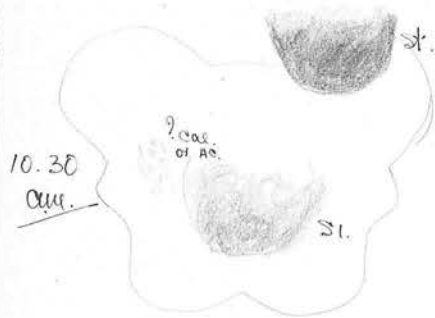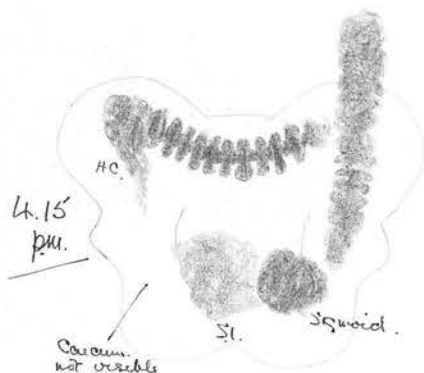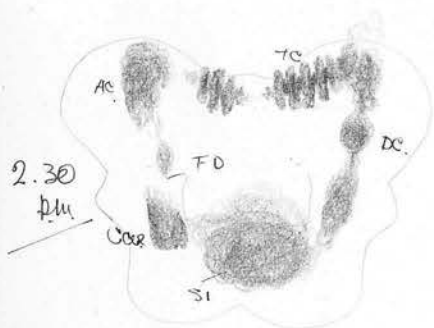
Tea 4.30 pm.

Supper 6.30 pm.
Bowels opened.

5.30 pm.

7.00 pm.
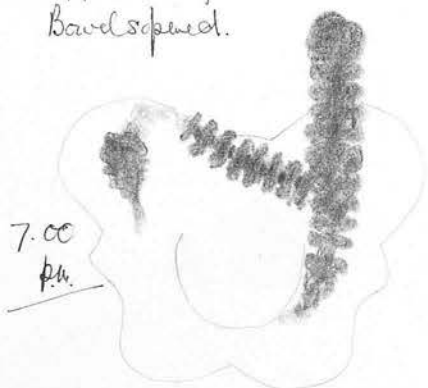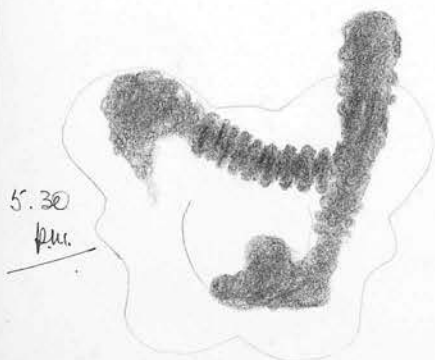
No Barium left at 26 hours.
Stomach empty 4–6 hours.
Small intestine empty 7½–9¾ hrs.
Lower part of ascending colon never filled with
Barium. Caecum only visible on 2
occasions.
Ulceration in lower ascending colon and possibly in Caecum.
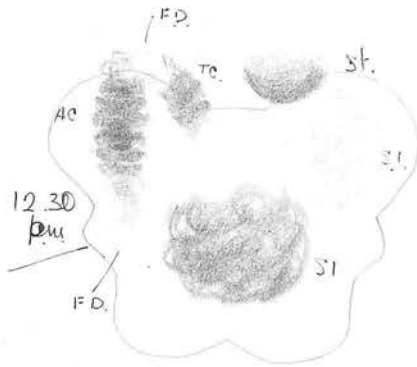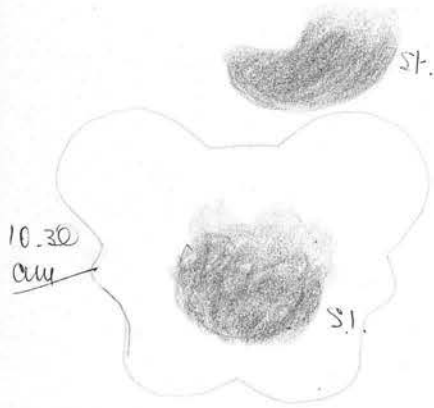
110

Barium meal 8 a.m.
Breakfast 8.15 a.m.

A Benzidine +
Radiography +

10.30
a.m.

St.
S.I.

12.30
p.m.

F.D.
TC.
St.
AC
S.I.
F.D.
S.I.

Dinner not taken

2.10
p.m.

D.C.
F.D.
— Caecum outlined
with gas.

3.30
p.m.

F.D.
F.D.

Tea. 4.30. p.m.

5.15
p.m.

Supper 6.30 p.m.

7.00
p.m.

Sig.

Bowels opened.

10.30
a.m.
(26 hours.)
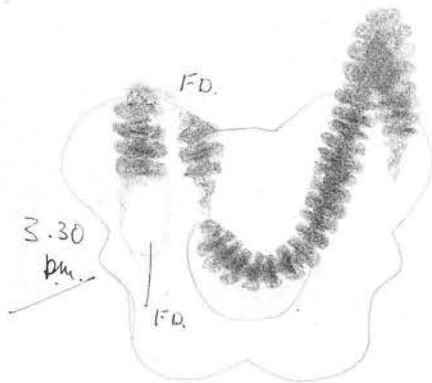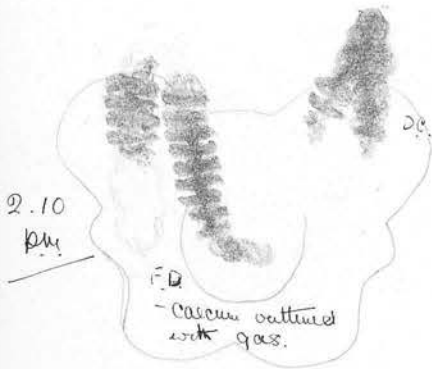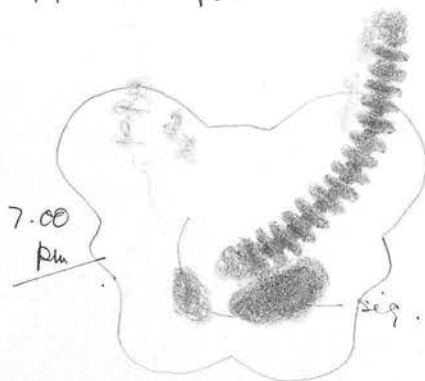
Stomach empty 4–6 hours.
Small intestine empty 4–6 hours.
Traces of meal left at 26 hours.

Caecum and hepatic flexure
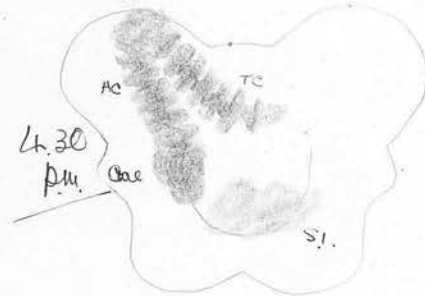never fill with barium —
ulceration in these sides
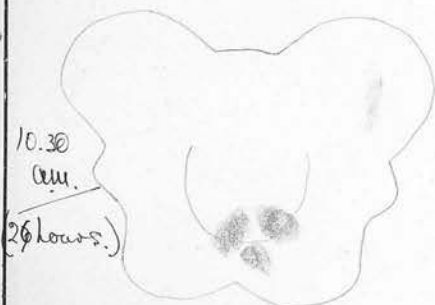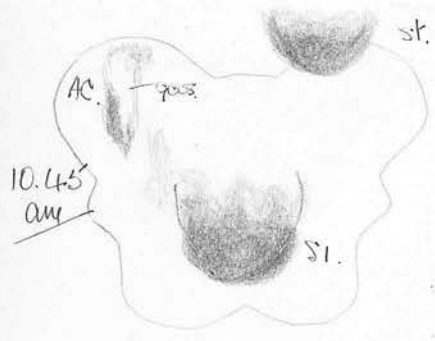
129.

Barium Meal 7.00 a.m.
Breakfast 8.15 a.m.

Benzidine +
A Radiography +

st.
AC. gas.
10.45 am
SI.

st
gas TC gas DC.
AC.
12.15 p.m.
? cae.
SI.

Dinner 1 p.m.

TC.
DC.
AC.
3.00 p.m.
Sigmoid.

AC.
5.00 p.m.
Sigmoid

Supper 6.15 p.m.

Bowels opened.

DC.
TC.
7.00 p.m.
Sigmoid.
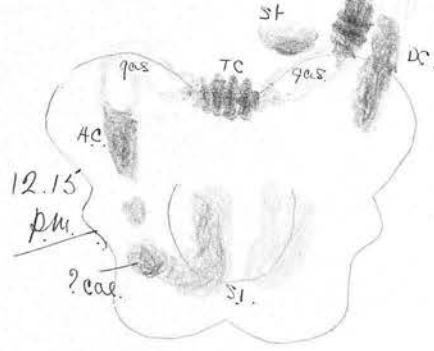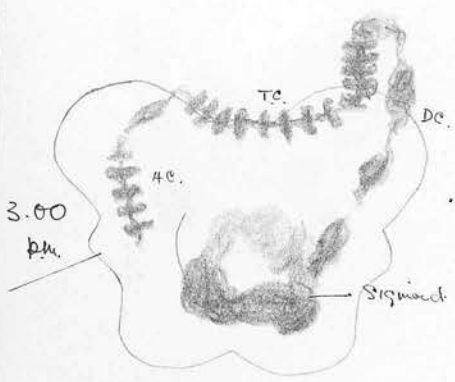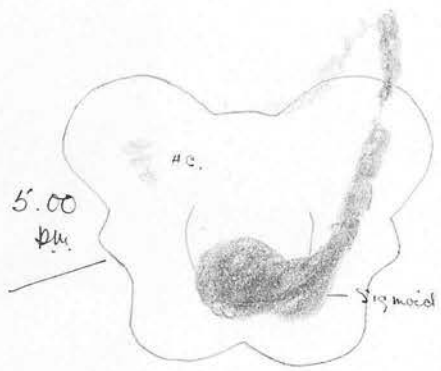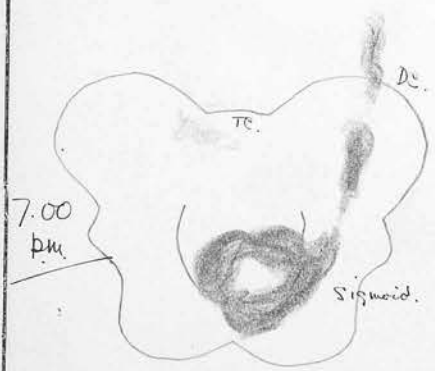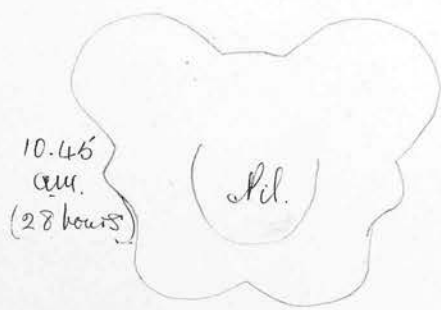
10.45 am.
(28 hours)
Nil.

Stomach empty in 5-8 hours.
Small intestine empty in 5-8 hours.
Barium completely evacuated in 28 hours.
Caecum and lower ascending colon never fill well.
and Barium only noticed in them on one occasion.

154.

Barium Meal 7.00 am.
Breakfast 8.15 am.

A   Benzidine +
    Radiography +

10.00
am.

AC   TC
FD   DC
Cœc
S.I.

12.45
pm.

FD
S.I.   Sigmoid

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30
p.m.
FD

5.00
pm.

Supper. 6.15 pm

Bowels opened.

6.45
pm.
FD
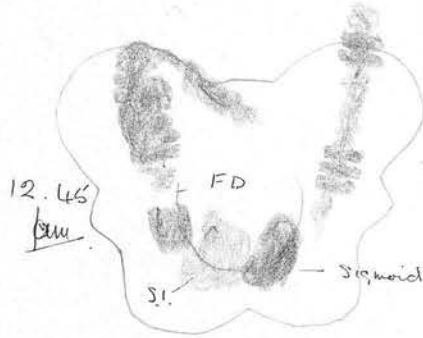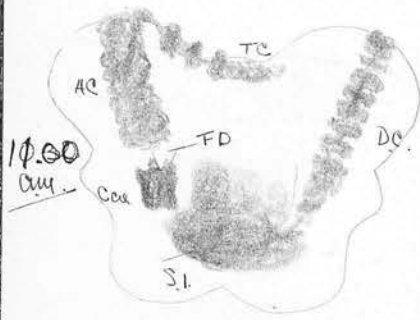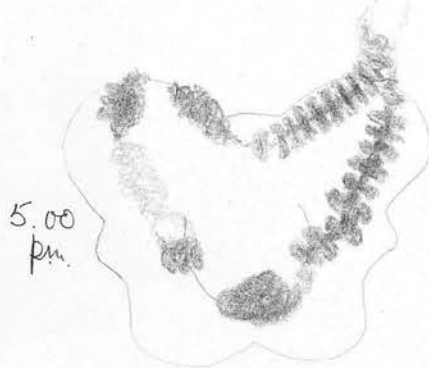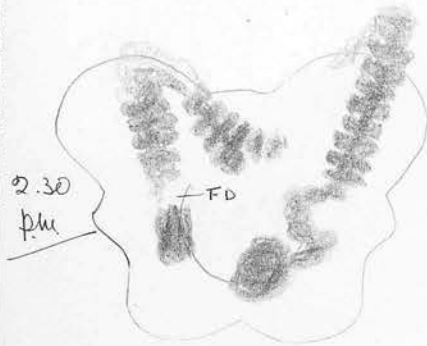
8.00
pm.
FD
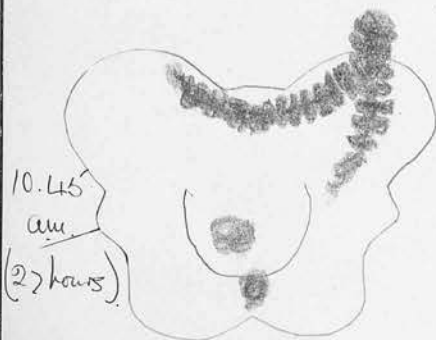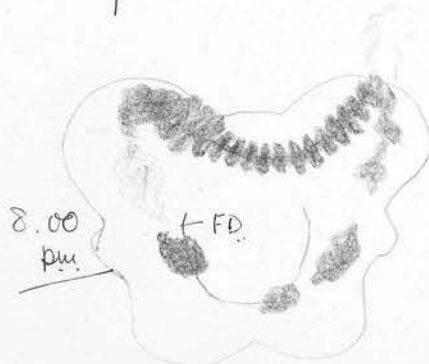
Stomach empty by 4th hour.
When meal as far as lower
descending colon.
Small Intestine empty by 7½ hours.
Large part of meal still present at
                              27 hours.
Constant filling defect in all
views at cæco-colonic
                    junction.

10.45
am.
(27 hours).

172.

Barium Meal 7.00 a.m.   A   Benzidine +
Breakfast 8.15. a.m.   Radiography +

S.I.   S.I.
                        (low)
10.30   S.I. distended
a.m.   c̄ gas.

Dinner 1.00 p.m.

12.30   Gas in S.I.
p.m.

Tea 4.15 p.m.

AC   Filling defect
             S.I.
2.30
p.m.
        Cae

4.30   F.D.
p.m.

S

Supper 6.30 p.m.

6.15   F.D.
p.m.

8.00   F.D.
p.m.
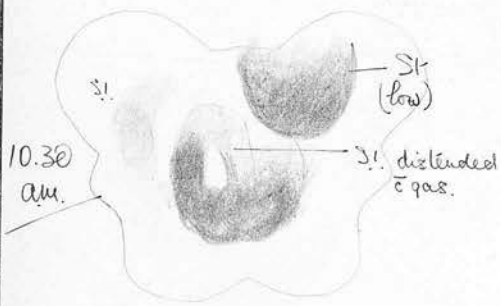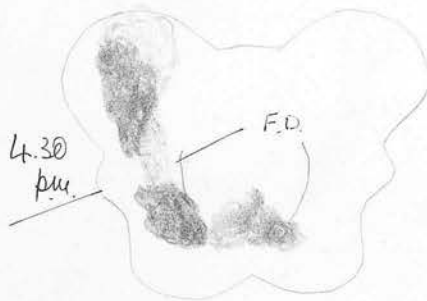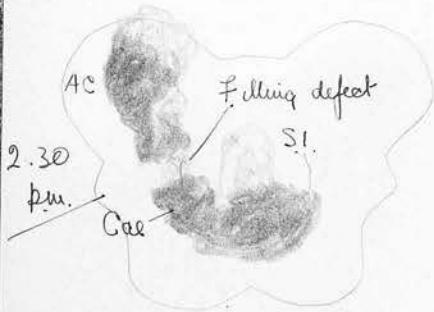
Bowels Opened.

Stomach, which lies low, empty 3½–5½ hrs.
Small intestine empty 9½–11¼ hrs.
Greater part of barium left at 27 hours.

10.30   TC   TC
a.m.
(27 hours)   Sigmoid
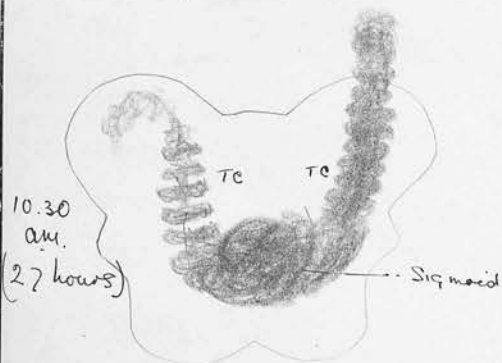
The caecum and ascending colon
both fill well   but there is
present at their junction a
well defined filling defect which
is persistent throughout the
period of the examination.
Note the loops of small intestine
distended with gas – the
only case where this was encountered.

228

Barium meal 7.00 am.
Breakfast 8.15 am.

A Benzidine +
Radiography +

St.
TC.
DC.
AC.
10.30 am.
Cæc.
SI.

AC.
12.30 pm.

Dinner 1.00 pm.
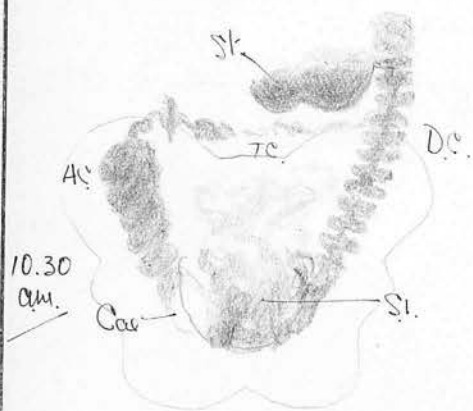
2.30 pm.

Tea 4.15 pm.
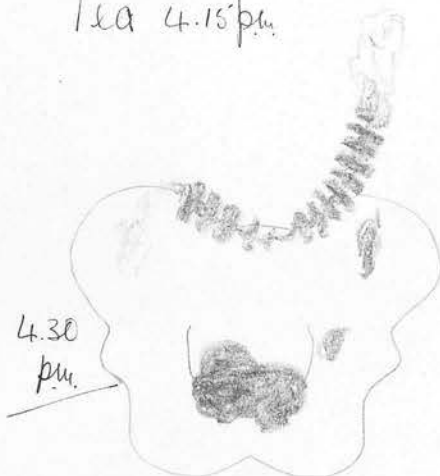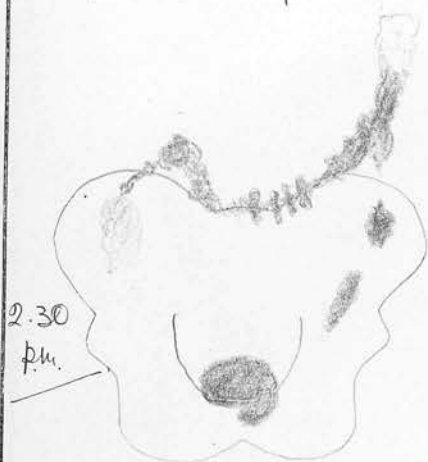
4.30 pm.

Supper 6.30 pm.
Bowels opened.
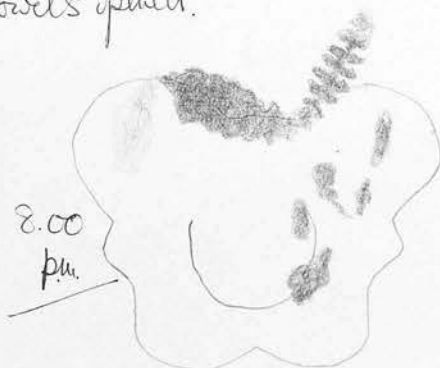
6.15 pm.

8.00 pm.

10.30 am
(2½ hours) — nil.

Stomach empty 3½ - 5½ hours.
Small intestine empty at 5½ hours.
Cæcum never filled with barium.
Hepatic flexure never filled.
General hypermotility.
Evidence of ulceration at the
Cæcum and possibly at hepatic flexure.

9.

Barium meal 7.00 am.
Breakfast 8.15 am.

St.

AC

10.30
am.

2Cat

S.I.

12.30
pm.

S.I.

Dinner 1.00 pm.

2.30
pm.

Cae.   Sigmoid.
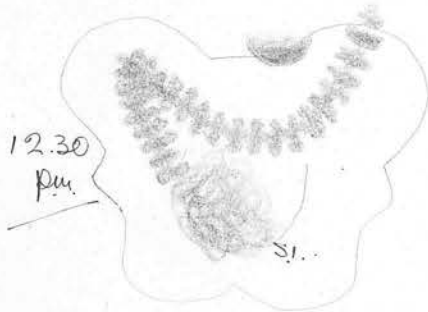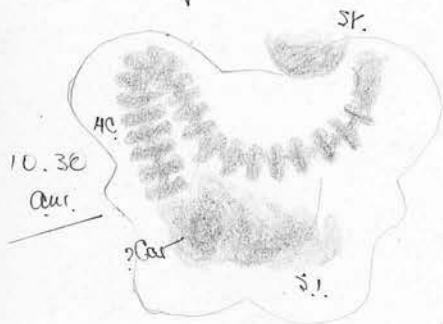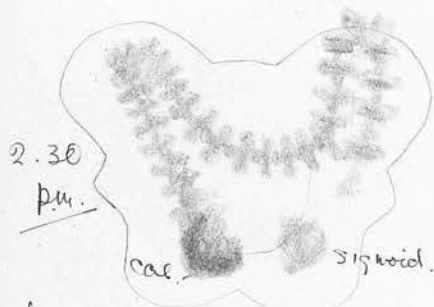
At 4.30 pm. condition ISQ
as above.

6.15
pm.

Cae

At 8.00 pm. Condition
ISQ. as above.

Bowels opened.
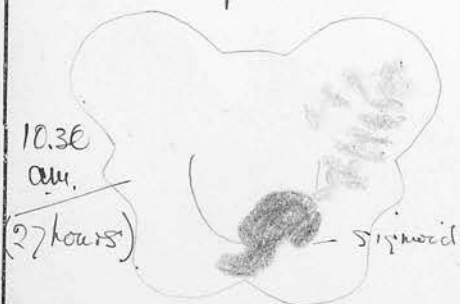
10.30
am.
(27 hours)

Sigmoid

Stomach empty 5½-7½ hours.
Small intestine empty. 5½-7½ hours.
Part of meal still present at 27 hours.
In the earlier sketches the caecum could not be distinguished
from the small intestine and when it became definable
the filling was found to be defective — the small
intestine was then however empty.
No definite evidence of ulceration.

155.

Barium meal 7.00 am.
Breakfast 8.15 am.

B Benzidine +
Radiography—

10.30
am.

Sl.
Sl.

? Colon or S.I.

12.30
p.m.

Sl.
S.I.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30
p.m.

A.C.
T.C.
Sl.
Cae.
S.I.

4.30
p.m.
Cae.

Sl.

Bowels. opened.

5.45
p.m.
Cae.

Ac.
Sl.

10.30
am.
27 hours
Cae.
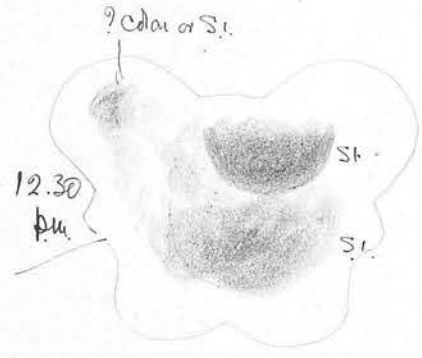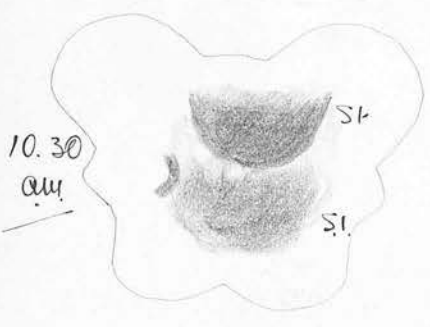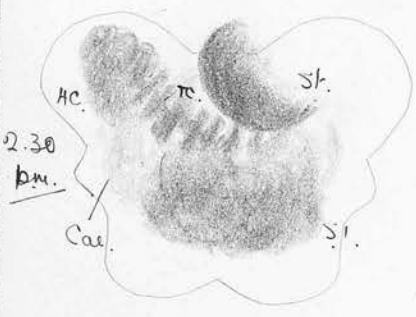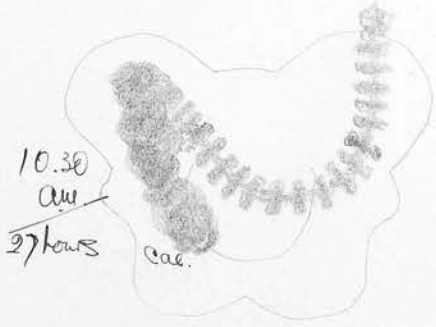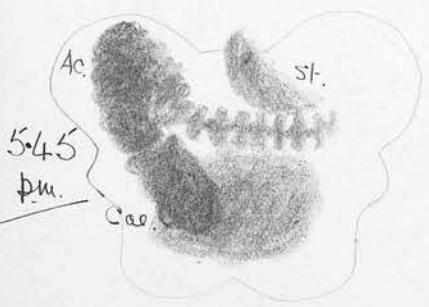
Neither stomach nor small intestine empty at 11 hours.

Large part of meal present at 27 hours.

Delay in stomach and small intestine

Caecum does not fill well in earlier views

but fills completely in the later ones

No definite evidence of ulceration.

218

Barium meal 7.00 am.
Breakfast 8.15 am.

B Benzidine +
Radiography ?

?Cae.

10.30
am.

TC

S.I.

? App

12.30
pm

S.I.

Dinner 1.00 pm.
Bowels opened.

Tea. 4.15 pm.

2.30.
pm.

S.I.

?Cae.

4.30
pm.

Sigmoid

Supper 6.30 pm.

Bowels opened.

8.00
pm

10.30
am.

(27 hours)

Stomach empty within 3½ hours.
Small intestine empty 7½ - 10 hrs.
Part of meal still present at
27 hours.

It has been found difficult
to interpret this case
except upon the assumption
that the caecum is in
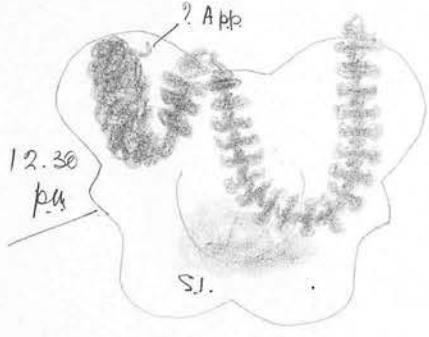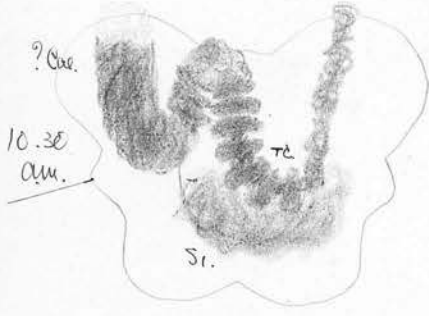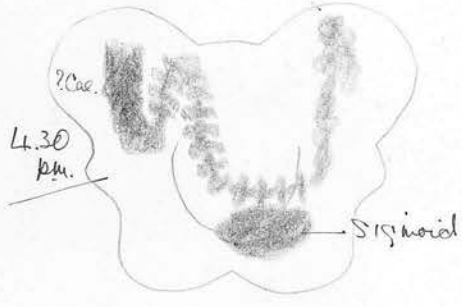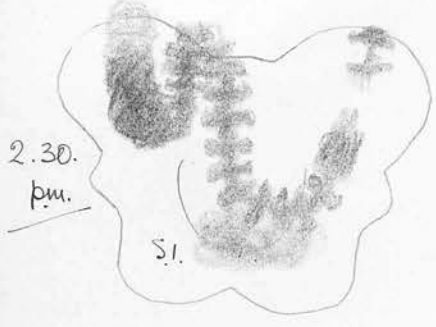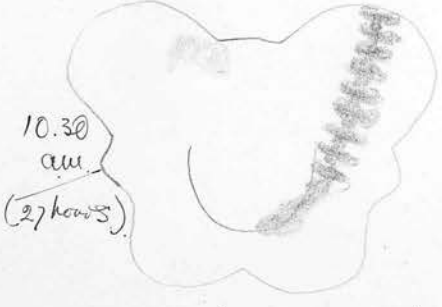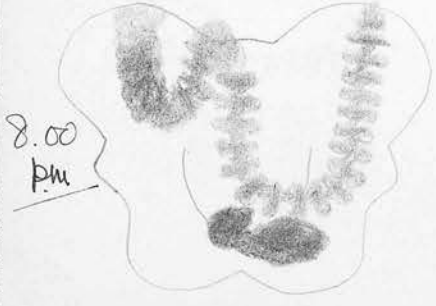
an inverted position
lying with its blind extremity
under the liver — which
will explain the small structure
noticed in the 2nd view as
being the appendix

No evidence of
ulceration.

193.

Barium meal 7.00 a.m.
Breakfast. 7.15 a.m.

B Benzidine +
Radiography —

10.30 a.m.
st.
Ac.
Cw
Si.

12.30 p.m.
st.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30 p.m.

4.30 p.m.

Supper 6.30 p.m.
Bowels opened

6.15 p.m.
sigmoid.

8.00 p.m.

Bowels opened.

Stomach empty 5½ - 7½ hrs
Small intestine empty. 7½ - 9½ hrs
No filling defect — no
evidence of ulceration.

10.30 a.m.
(27 hours)

202.

Barium meal 7.00 a.m.
Breakfast 8.15 a.m.

B Benzidine +
Radiography —

10.30
a.m.
HC
Cae.
TC
S.I.

12.30
p.m.

Dinner 1.00 p.m.

Tea. 4.15 p.m.

2.30
p.m.
App.
S.I.

4.30
p.m.
Sigmoid

Supper. 6.30 p.m.

6.15
p.m.

8.00
p.m.

10.30
a.m.
(27 hours).
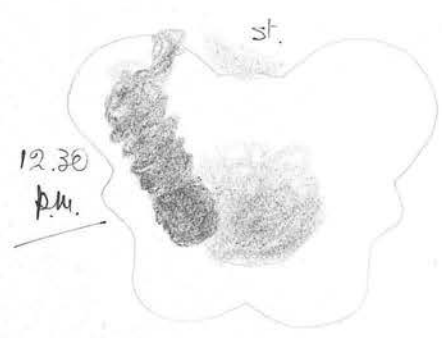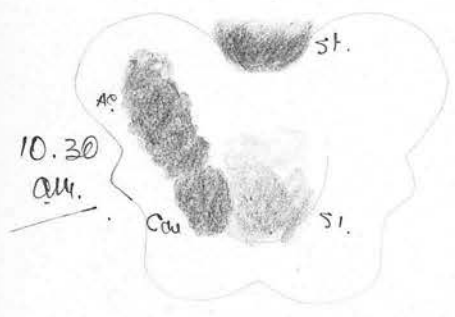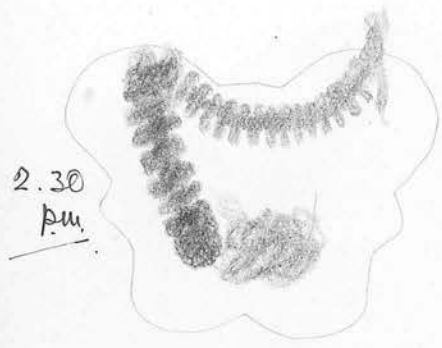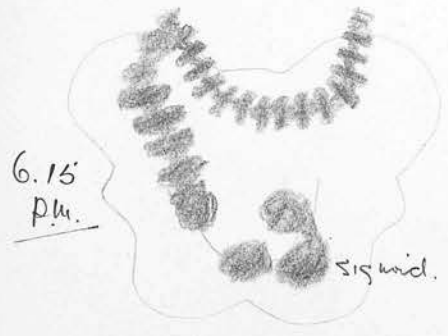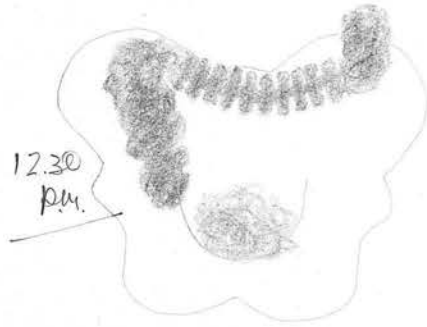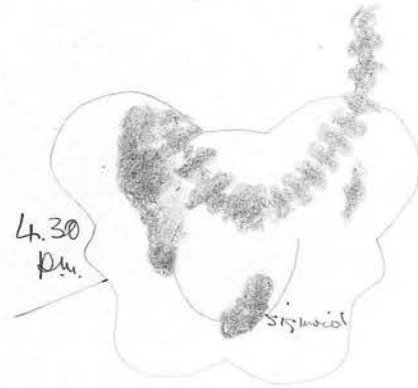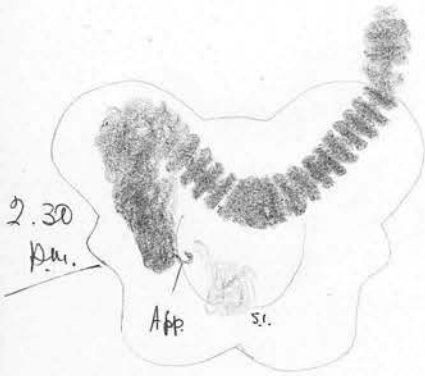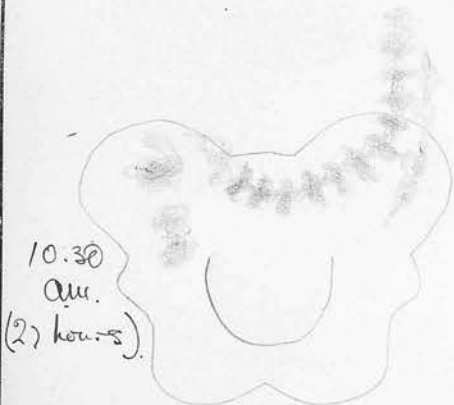
Stomach empty before 3½ hours
Small intestine empty 7½-9½ hrs
Small quantity of meal present
in ascending and transverse colons
at 27 hours

No indication of ulceration.

208.

Barium meal 7.00 a.m.
Breakfast 8.15. a.m.

B   Benzoine +
     Radiography —

10.30
a.m.

st.

AC

TC.

Cæc.

si.

12.30
p.m.

Dinner 1.00 p.m.

Tea. 4.15 p.m.

2.30.
p.m.

4.30
p.m.

Si.

Sigmoid.

Supper. 6.15. p.m.

6.30
p.m.

Sigmoid.

8.00
p.m.
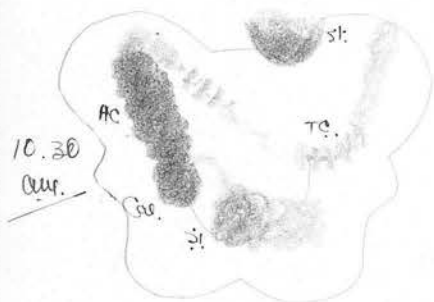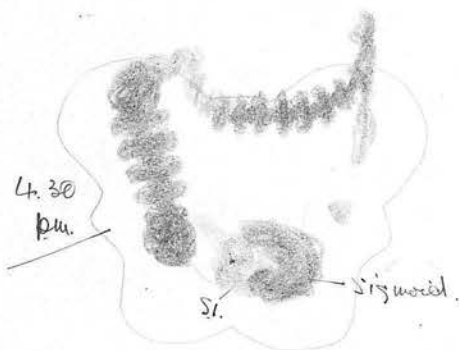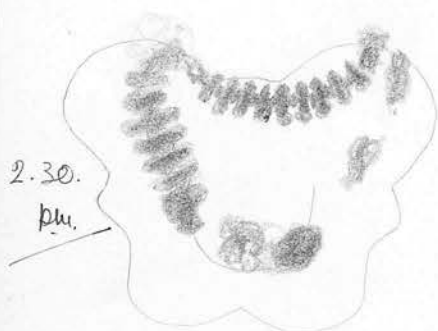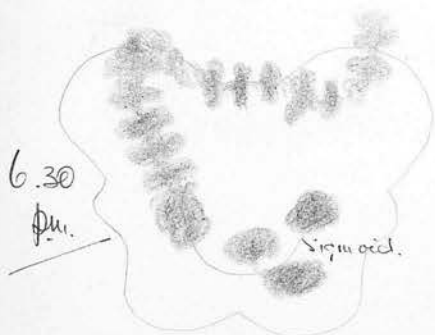
Bowels opened.

Stomach empty 3½ - 5½ hours.
Small intestine empty. 9½ - 11½ hours
No filling defects —
no sign of ulceration.
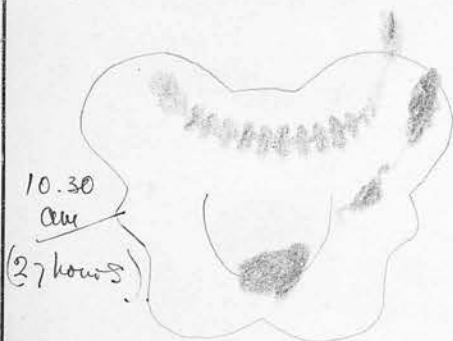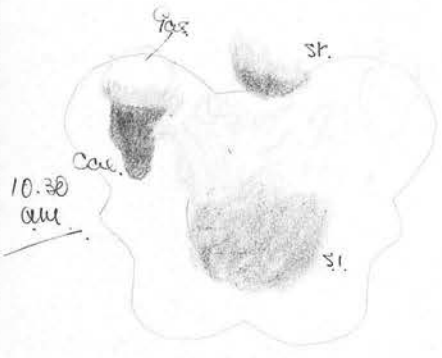
10.30
a.m.
(27 hours.)

211

Barium meal 7.00 a.m.
Breakfast 8.15 a.m.

B Benzidine + Radiography.?

10.30 a.m.

12.30 p.m.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30 p.m.

4.30 p.m.

Supper 6.30 p.m.

6.15 p.m.

8.00 p.m.

Bowels opened.

10.30 a.m.
(27 hours)

sigmoid
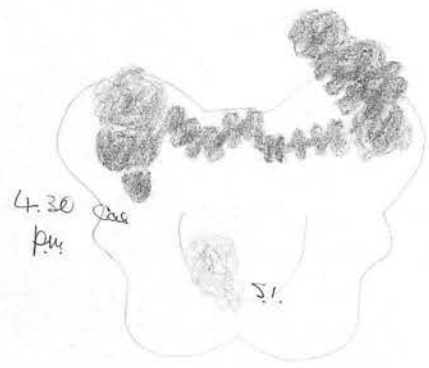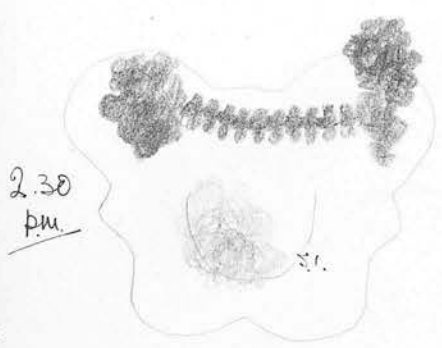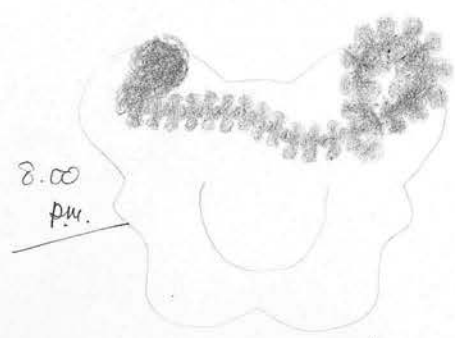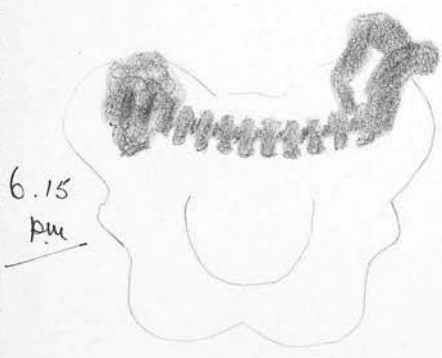
Stomach empty 3½ – 5½ hours.
Small intestine empty 9¼ – 11¼ hours.
Large part of meal left at 27 hours.

Although there is here no definite
filling-defect, the caecum fills in a
curious manner – this may be that
type in which the intestinal wall is
thickened and hardened and
has very little power of contraction.
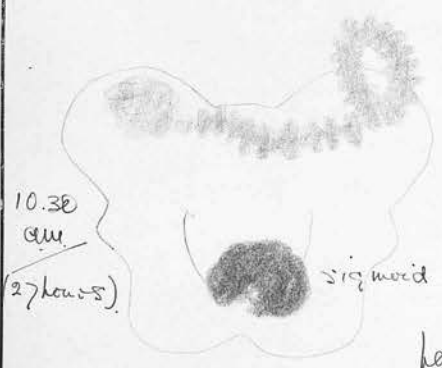
192.

Barium meal 7.00 am.
Breakfast 8.15 am.

B Benzidine +
   Radiography ?

10.30
am.
St.
SI.

12.30
pm.
St.
Cæ.
SI.

Dinner 1.00 pm.

Tea 4.15 pm.

2.30
pm.
HC.
St.
Cæ.
SI.

4.30
pm.
Tea.
St.

Supper 6.30 pm.

6.15
pm.

8.00
pm.
+c
St.
Cæ.
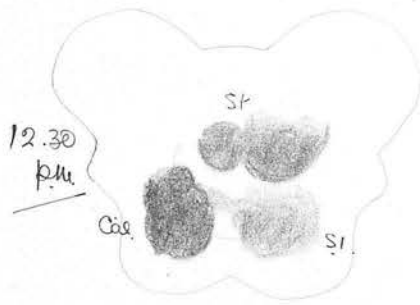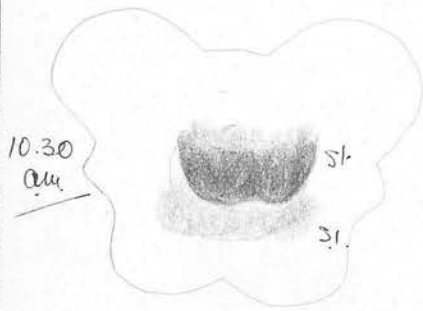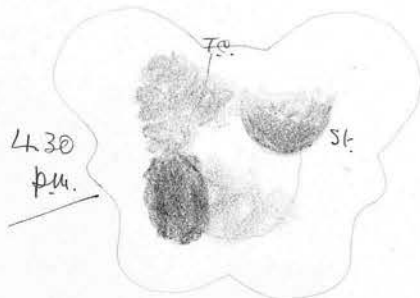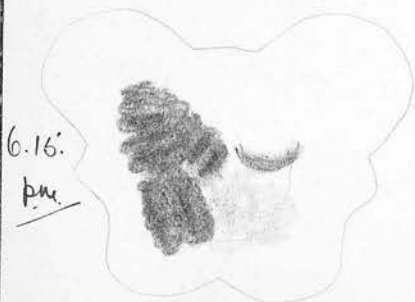
Bowels not opened.

Bowels not opened.

10.30
am.
(27 hours)
FO.

8.00
pm.
(37 hours)
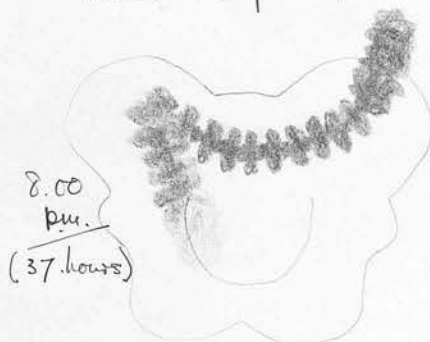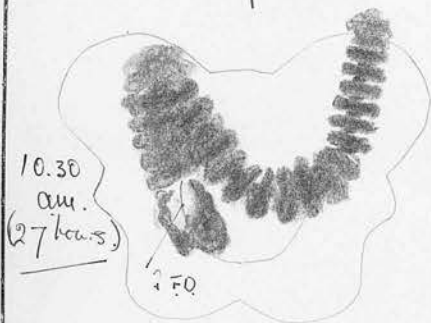
Stomach not empty at 13 hours.
Small intestine not empty at 13 hours.
Entire meal still present at 37 hours.
No definite evidence of ulceration.

Marked gastroptosis present

2.05.

Barium meal 7.00 am.
Breakfast 8.15 am.

B Benzidine +
Radiography —

10.30
am

Sk.

? Cæc.

12.30
pm

Dinner 1.00 pm
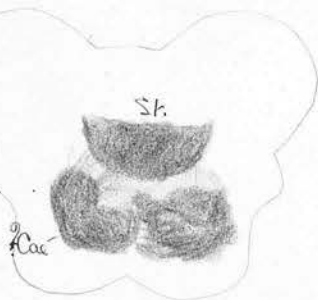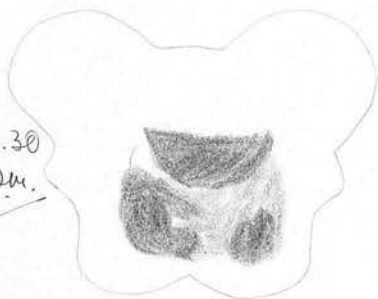
Tea 4.15 pm.

2.30
pm.
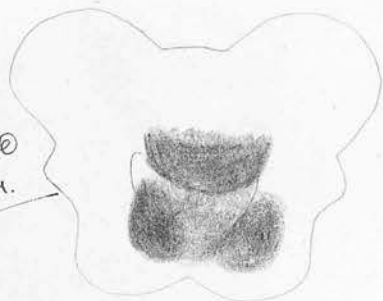
4.30
pm.

Supper. 6.15 pm.

6.30
pm.

? colon.

Sk.

8.00
pm.
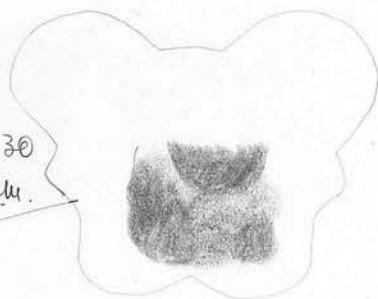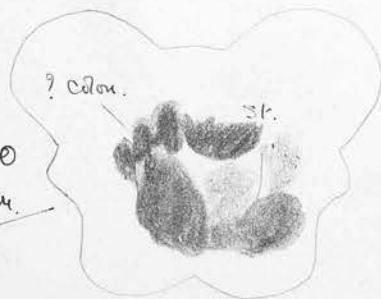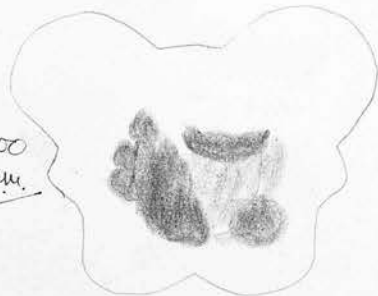
Bowels opened.

10.30
am
(27 hours.)

Stomach not empty at 13 hours
Small intestine   — ?
Large part of meal left at 27 hours.
Marked generalised visceroptosis
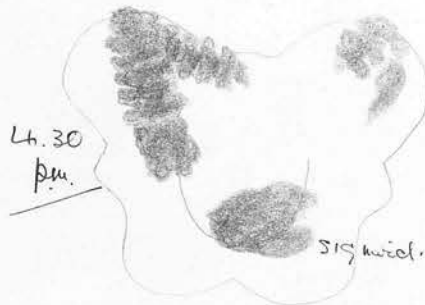is present making differentiation
of structures impossible
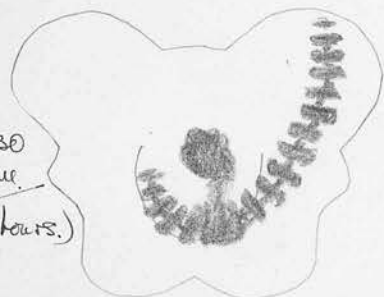
2.06.

Barium meal 7.00 a.m.
Breakfast 8.15 a.m.

B. Benzidine +
Radiography —
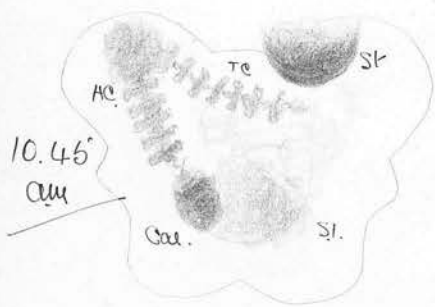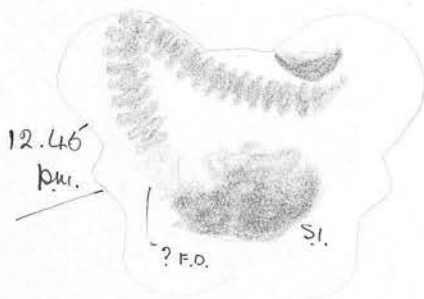
10.45 am

12.45 p.m.

Dinner 1 p.m.

Tea 4.15 p.m.
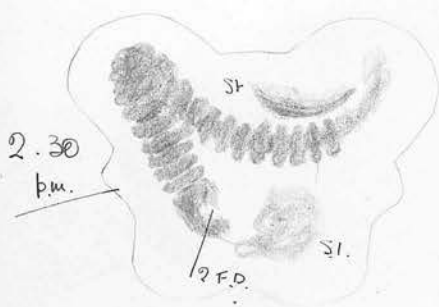
2.30 p.m.
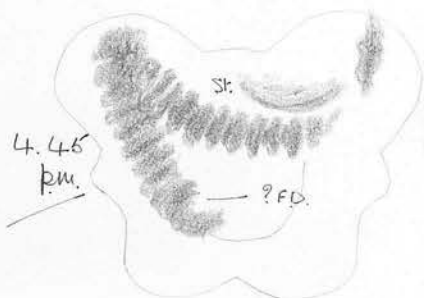
4.45 p.m.

Supper. 6.30 p.m.
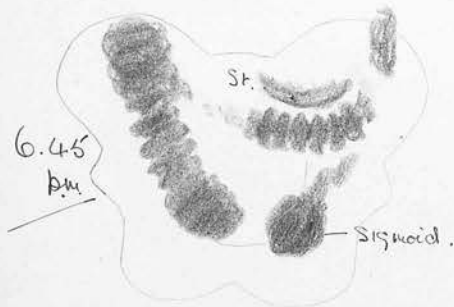
6.45 p.m.
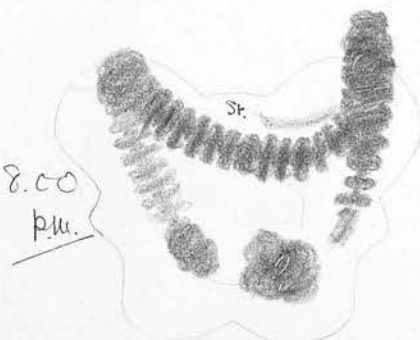
8.00 p.m.

Bowels opened.
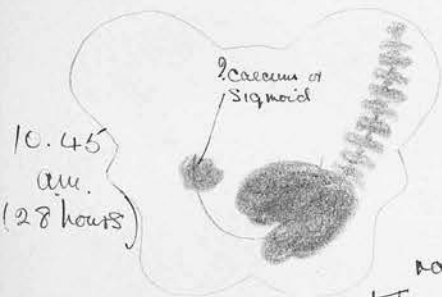
10.45 am. (28 hours)

Stomach not empty at 13 hours.
Small intestine empty 7½–9¾ hrs. —(probably
small quantity of Barium trapped in stomach by
succeeding meals.)
Large part of meal left at 28 hours.
First 2 pictures show ? filling defect at caeco-
colonic junction and second 2 views show
? F.D. in Caecum but last 2 views show
perfect filling of both parts.
        Ulceration has therefore not been diagnosed
radiologically though such doubtful areas
        taken together c̄ a +ve occult blood test
would indicate the probability of ulcers at those sites.
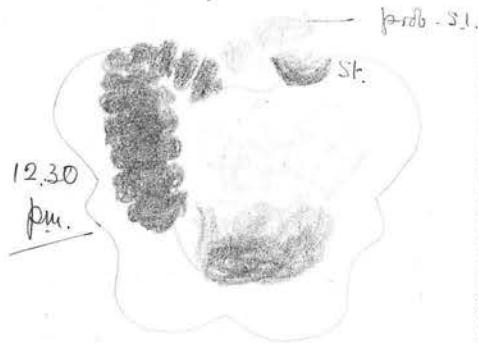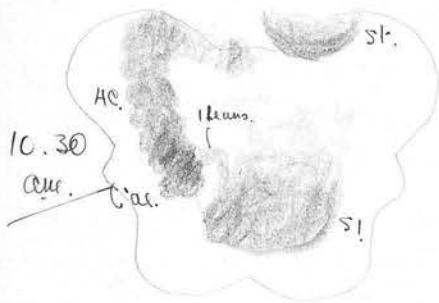
178.

Barium meal 7.00 a.m.
Breakfast 8.15 am.

B Benzidine +
Radiography —

→ prob. S.I.

St.

AC.

Ileum.

10.30
am. C.ae.

St.

S.I.

12.30
pm.

Dinner 1.00 p.m.

Tea 4.15. p.m.

2.30
pm.

4.30
pm.

Supper 6.30. p.m.

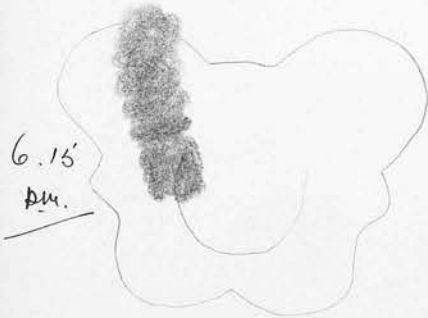6.45
pm.

8.00
pm.

Bowels opened.

10.30
am.
(27 hours)
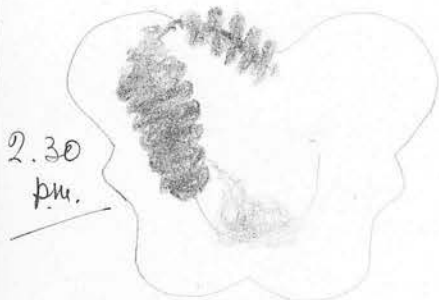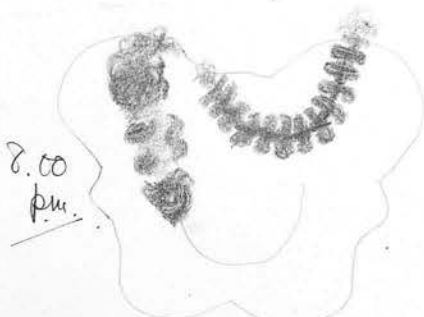
Stomach empty 5½ - 7½ hours.
Small intestine empty 7½ - 9½ hours.
Part of meal left at 27 hours
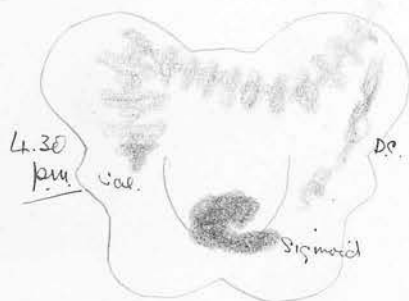No constant filling defects
— No evidence of ulceration.

181

Barium meal. 7.00 a.m.
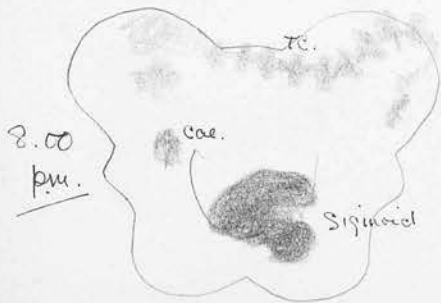Breakfast 8.15 a.m.

B Benzidine +
Radiography —

10.30 a.m.

12.30 p.m. ?F.D.

Dinner 1.00 p.m.

Tea 4.15. p.m.

2.30 p.m.

? sigmoid

S.I.

4.30 p.m.

— sigmoid

Bowels opened.

Supper 6.30 p.m.

6.15. p.m.

— ? F.D.

8.00 p.m.
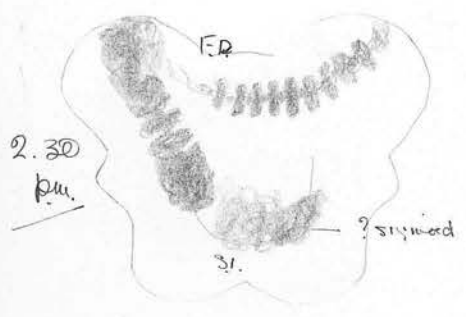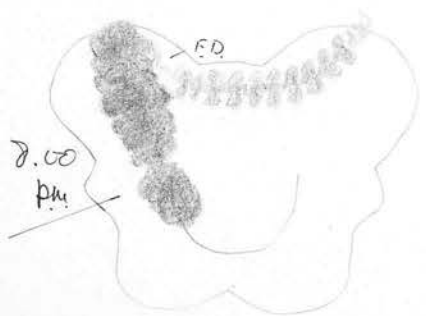
Bowels opened.

Stomach empty 5½ – 7½ hrs.
Small intestine empty 9½ – 11¼ hrs.
Large part of meal still present.
at 27 hours.

10.30 a.m.
(27 hours)
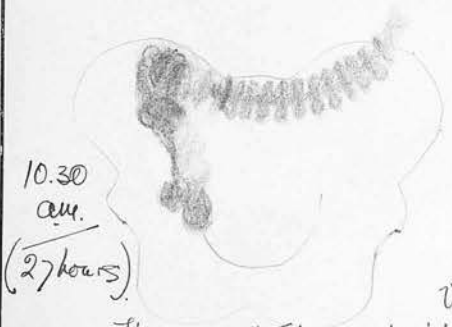
Doubtful filling-defect in 2 views
at caeco-colonic junction.
Filling-defect constant in all but last
view in 1st part of transverse colon.
There is therefore doubt as to the absence of ulceration
radiologically — a +ve benzidine test suggests that ulceration
is present.

188

Breakfast 8.15. am.
Barium meal 9.00 am.

B Benzidine +
   Radiography —

10.45
am.
St.
(active)

12.00
noon
St.
S.I.

Dinner 1.00 p.m.

2.30
p.m.
TC.
AC.
S.I. overlying Caecum.

3.15
p.m.

Tea 4.15 p.m.

5.15
p.m.
Cae
S.I.

Supper 6.30. p.m.

6.46
p.m.
Cae

I.S.Q at 8.00 p.m.
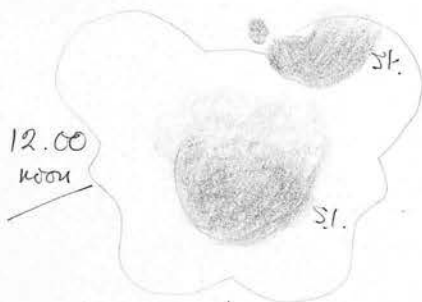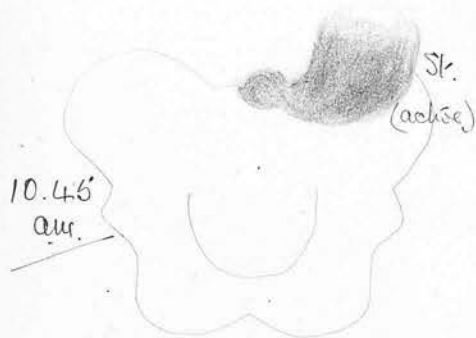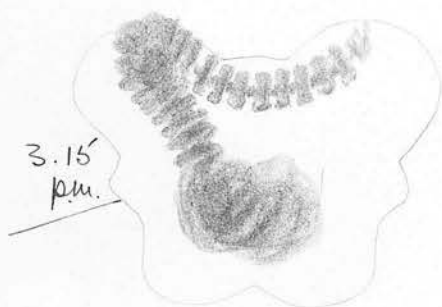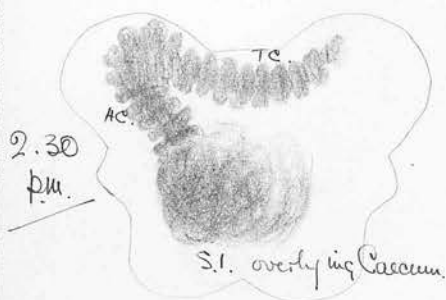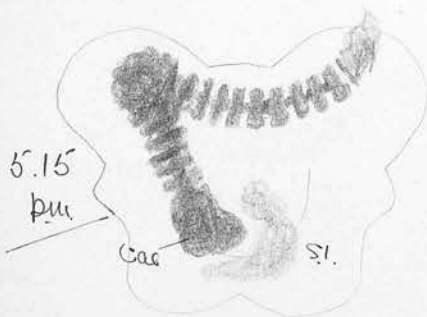
Bowels opened.
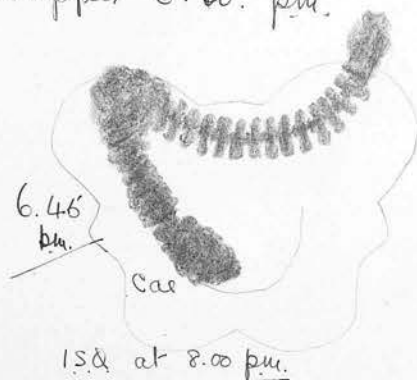
10.30
am
(26 hours)
— Sigmoid.
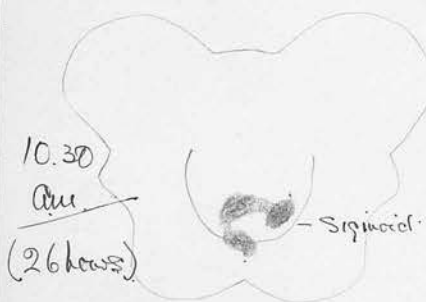
Stomach empty 3 – 5½ hours.
Small intestine empty 8¼ – 9¾ hrs.
Very small quantity of meal left
at 26 hours.

No filling defects
no ulceration. indicated
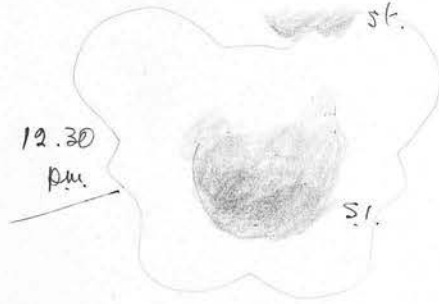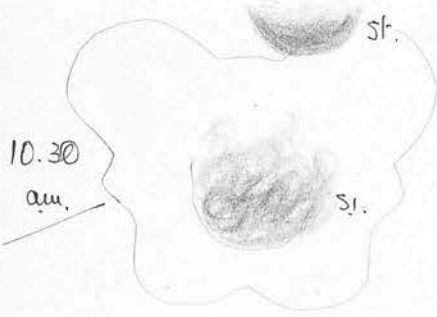
182

Barium meal 7.00 a.m.
Breakfast 8.15 a.m.

B Benzidine +
Radiography —

10.30
a.m.

st.

S.I.

12.30
p.m.

st.

S.I.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30
p.m.

AC
TC
Cæ
S.I.

4.30
p.m.

AC
TC
Cæ
S.I.

Supper 6.30 p.m.

6.15
p.m.

TC
Cæ

TC
AC
Cæ

Bowels opened.

10.30
a.m.
(27 hours)

AC
Cæ
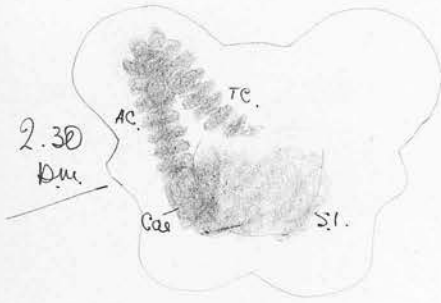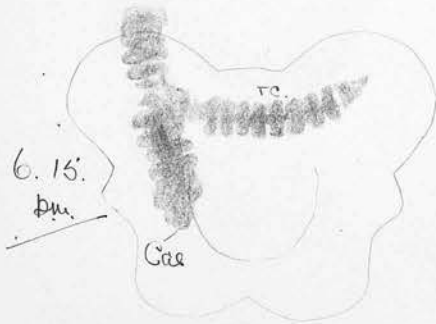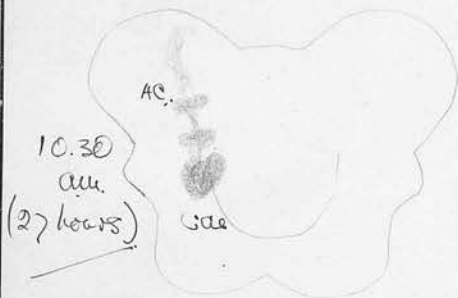
Stomach empty 5½ – 7½ hours.
Small intestine empty. 9½ – 11¼ hrs.
Small part of meal still present
in Cæcum and ascending colon
at 27 hours.

No filling - defects

195

Barium meal 7.00 am.
Breakfast 8.15. am.

B Benzidine +
    Radiography —

10.30 am.
A.C. · T.C. · S.I. · St. · App. · S.I.

12.30 pm.
St. · S.I.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30 pm. Cae. · S.I.

4.30 pm. Cae. · S.I.

Supper. 6.30 pm.

6.15 pm. ileum · App.

8.00 pm.

Bowels opened.

10.30 am (27 hours) A.C. · Cae. · App. · Sigmoid.
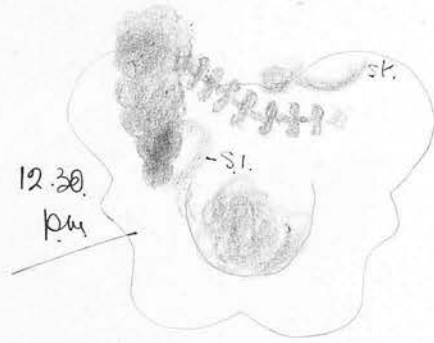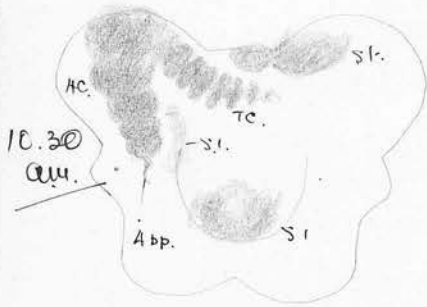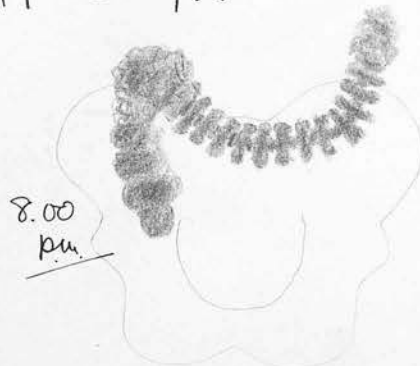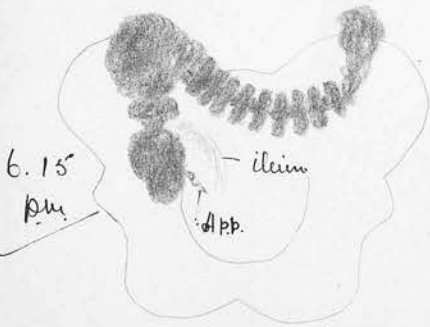
Stomach empty 5½ - 7½ hours.
Small int. empty 11½ hours.
Part of meal still present at 27 hours.
Caecum, ascending & transverse Colon. all fill well at various times — no permanent filling defect. Appendix filled on several occasions

191
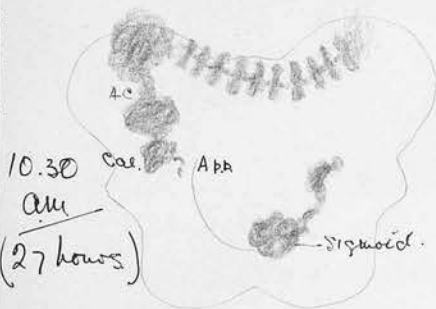
No Breakfast.
Barium meal 9.00 a.m.

B Benzidine +
Radiography –

No Dinner
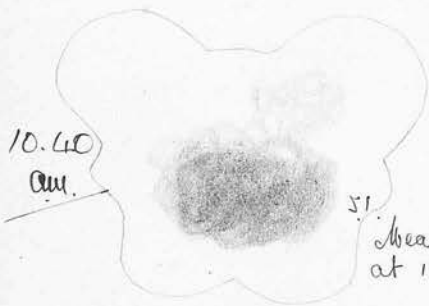
10.40
a.m.
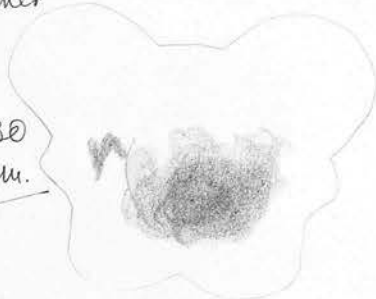
S.I.

Meal still in S.I.
at 12.45 p.m.

2.30
p.m.

Tea 4.15 p.m.

3.50
p.m.

H.C.

Cae.

S.I.

5.00
p.m.

T.C.

H.C.

Cae.

S.I.
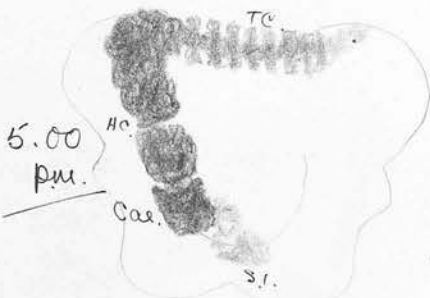
Supper. 6.30 p.m.

6.00
p.m.

7.15
p.m.

Cae.
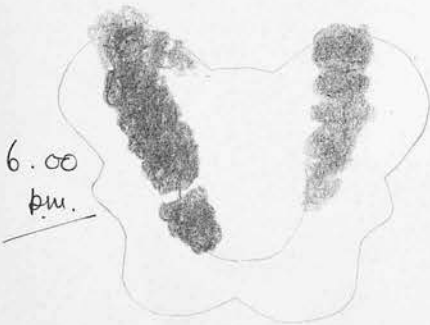
Bowels opened
8.30 p.m.
– but not
on the following
morning.

8.15
p.m.

10.46
a.m.
(26 hours)
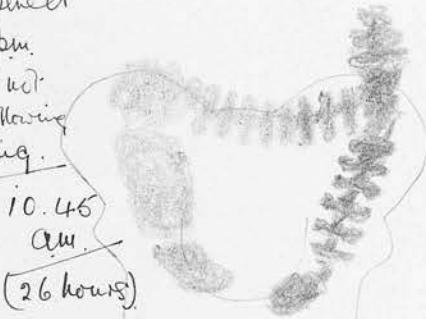
Stomach empty within 2 hours. Small intestine empty. 8-9 hrs.
Greater part of meal still present at 26 hours.
Constant spasm present at caeco-colonic junction
but not sufficient defect to allow of diagnosis of
ulceration.

58.

Breakfast 8.15' am.
Barium meal 10.00 a.m.

B Benzidine +
Radiography —

Dinner not taken.

St.(tonic)

1.00
pm.

S.I.

2.45
pm.

St.
TC
AC
DC
Cae
S.I.

Tea 4.45 pm.

St.

4.30
pm.

S.I.   Sigmoid.

5.40
pm.

S.I.   Sigmoid
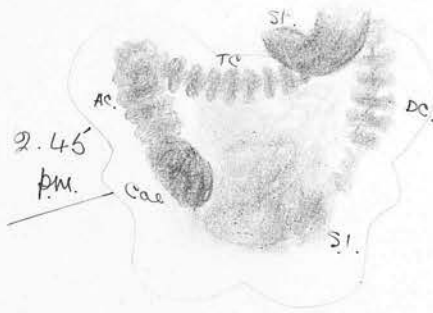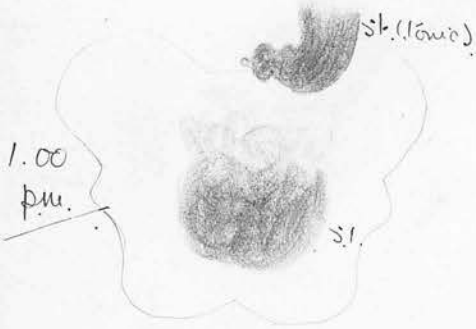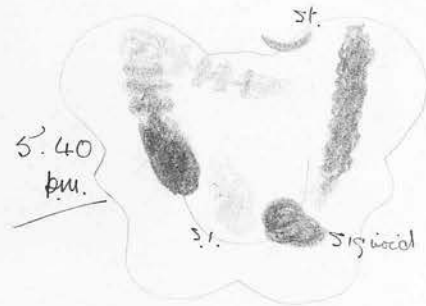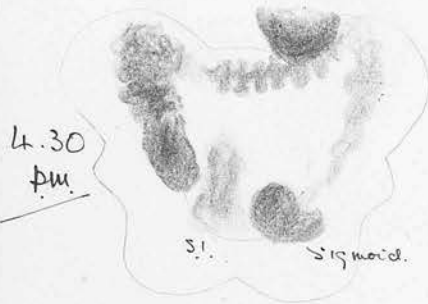
Supper 6.30 pm.
Bowels opened.

Bowels opened.

7.10
pm.

11.00
am
(25 hours)
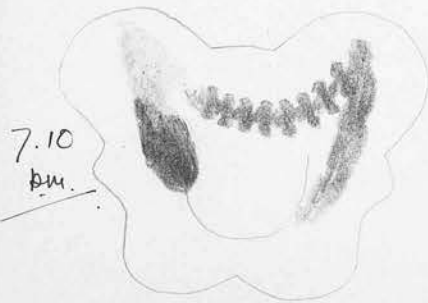
Stomach empty 8-9 hours.

Small intestine empty 8-9 hours

Part of meal still present at 25 hours.

Caecum and ascending colon fill well at

various times — no evidence of ulceration.

48.

Barium meal 8.00 a.m.
Breakfast 8.15 a.m.

B Benzidine +
Radiography

11.25 a.m.   Sk.
Cae.
S.I.

12.40 p.m.   Sk.
Cae.   TC.   DC.
S.I.

Dinner 1.00 p.m.

2.30 p.m.   F.D.

4.00 p.m.   F.D.
S.I.

Tea 4.15 p.m.
Bowels opened.

Supper. 6.15 p.m.

5.35 p.m.   F.O.   TC.
Cae.   S.I.

7.15 p.m.   F.D.
Cae.

Bowels opened.

10.30 a.m.
(26 hours)   DC.
Sigmoid.

Stomach empty 5 – 7½ hours.
Small intestine empty 9½ – 11¼ hours.
Part of meal still present at 2) hours.
Caecum does not fill well in early
pictures, but fills completely later.
Constant filling defect in transverse
colon, but on account of its position
it is difficult to diagnose
ulceration there with confidence.

111

Barium meal 7.00 a.m.
Breakfast 8.15 a.m.

B
Benzidine +
Radiography ?

10.45 a.m.

S.I.

12.30 p.m.

1.C.
ileum
?cae.
?s.i.
S.I.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30 p.m.

S.I.

6.00 p.m.

S.I.

Supper 6.15 p.m.

6.45 p.m.

T.C.

8.00 p.m.

? F.D.

Bowels not opened.

10.45 a.m.
(28 hours)

T.C.
cae.
sigmoid.

Condition S.S. at 31 hours.

Stomach empty before 3¾ hours.
Small intestine empty 10–12 hours.
Entire meal left at 31 hours.
Interpretation is here difficult – whether the lower
limit of the caecum is the large mass shown or
the small mass seen in series 1 & 2. There
may also be a filling defect in the transverse
colon. This doubt together with the presence
of abdominal pain and a +ve benzidine
test indicate the presence of ulceration

117

Barium meal 7.00 a.m.
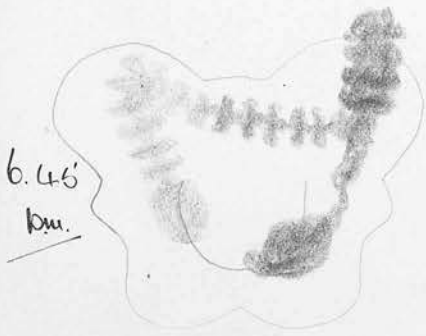Breakfast 8.15 a.m.

c Benzidine —
Radiography

10.30
am.

SI.
AC
Cae
SI.

12.30
pm.

TC
Cae
SI.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30
pm.

SI.

4.30
pm.

DC.
SI.
Sigmoid

Supper 6.15.

630
pm.

8.00
pm.

Bowels opened.

10.30
am.
(27 hours).

TC.
DC.
Cae
Sigmoid

Stomach empty 5½ – 7½ hours.
Small intestine empty 9½ – 11½ hours.
Part of meal still present at
27 hours.

No evidence of ulceration

212.

Barium meal 7 a.m.
Breakfast 8.15 a.m.

Benzidine —
Radiography —

10.30
a.m.

12.30
p.m.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30
p.m.

Sigmoid

4.30
p.m.

Bowels opened

Supper 6.30 p.m.

6.15
p.m.

Sigmoid

8.00
p.m.

Bowels not opened.

Stomach empty within 3½ hours.

Small intestine empty. 6½–7½ hours.

Part of meal still present at 24 hours.

No evidence of ulceration.

10.30
a.m.
(27 hours)

Barium meal 7.00 am.
Breakfast. 8.15 am.

Benzidine —
Radiography —

10.30 am.

12.30 p.m.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30 p.m.

4.30 p.m.

Supper. 6.30 p.m.

6.15 p.m.

8.00 p.m.
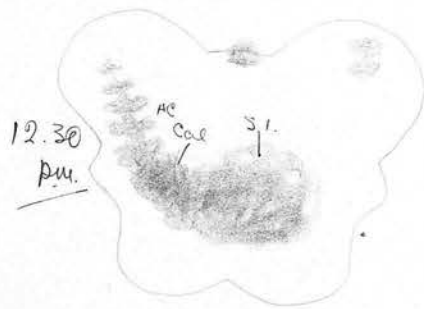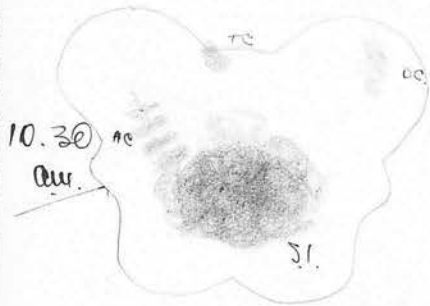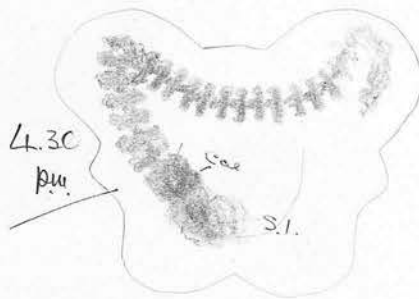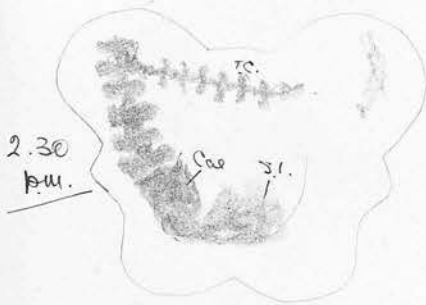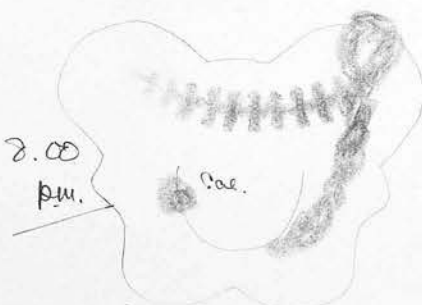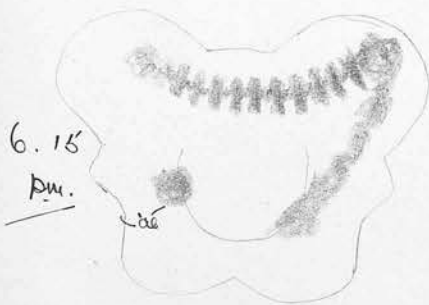
Meal completely evacuated before 2) hours.

Stomach empty before 3½ hours.

Small intestine empty 9½ - 11¼ hours.

Caecum could not be clearly seen on account of super-imposed ileum until the latter was empty but appeared to fill completely — no evidence of ulceration

217

Barium meal 7.00 am.
Breakfast 8.15 am.

Benzidine —
Radiography —

10.30
am.

St.

Cae.

S.I.

12.30
p.m.

St.

S.I.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30
p.m.

AC.

TS.

Cae.

S.I.

4.30
p.m.

Sigmoid.

Bowels opened.

Supper 6.30 p.m.

6.15
p.m.

8.00
p.m.

Bowels opened.

Stomach empty 5½ - 7½ hours.
Small intestine empty. 7½ - 9½ hours.
Part of meal still present at 27 hours
No evidence of ulceration.

10.30
am.

(27 hours)

Sigmoid.

Barium meal 7.00 a.m.
Breakfast 8.15 a.m.

Benzidine —
Radiography—

10.30 a.m.

12.30 p.m.

Dinner 1.00 p.m.

Tea 4.15 p.m.
Bowels opened

2.30 p.m.

4.30 p.m.

Supper 6.30 p.m.

Bowels opened.

8.00 p.m.

10.30 a.m.
(27 hours)

Stomach empty 3½ - 5½ hours.
Small intestine empty 5½ - 7½ hours.
Small part of meal still present at 27 hours.
No evidence of ulceration

187

Barium meal 7.00 am
Breakfast 8.15 am.

Benzidine —
Radiography

10.30 am.

Sl.

Sl.

12.30 pm.

?Sl.

Cæc.

Sl.

Dinner 1.00 pm.

Tea 4.15 pm.

2.30 pm.

AC.

TC.

Cæc.

Sl.

4.30 pm.

Supper. 6.30 pm

6.15 pm.

8.00 pm

Sigmoid

Bowels opened.

10.30 am
(27 hours)
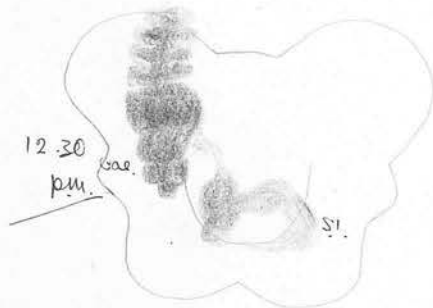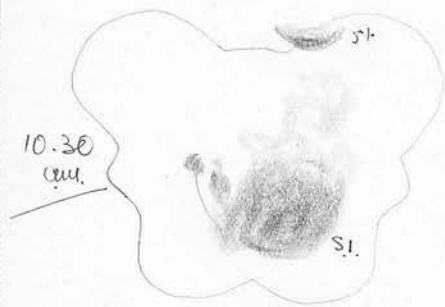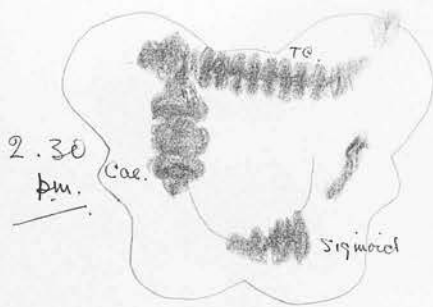
Stomach empty 3½ - 5½ hours.
Small intestine empty. 7½ - 9½ hours.
Trace of meal left at 27 hours.
Cæcum and colon fill well.
No evidence of ulceration.

204.

Barium meal 7.00 a.m.
Breakfast 8.15 a.m.

Benzidine —
Radiography —

10.45
am.

12.30
pm.

Dinner 1.00 p.m.

Tea 4.15 p.m

2.30
p.m.

5.00
pm.

Sigmoid

Supper 6.30 p.m.

Bowels opened

6.45
pm.

10.45
am.
(28 hours)
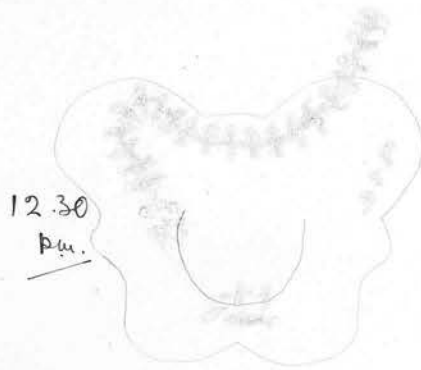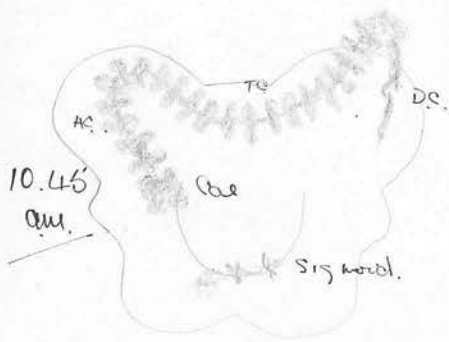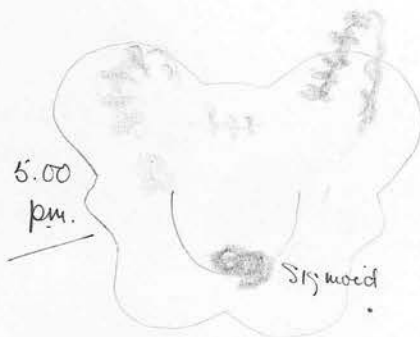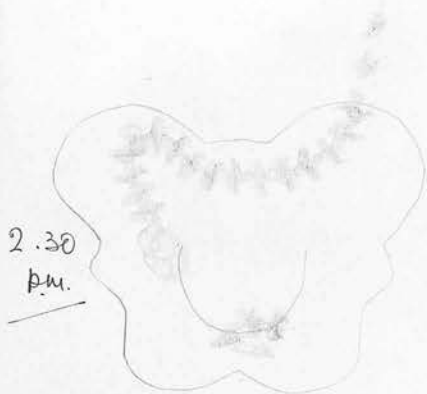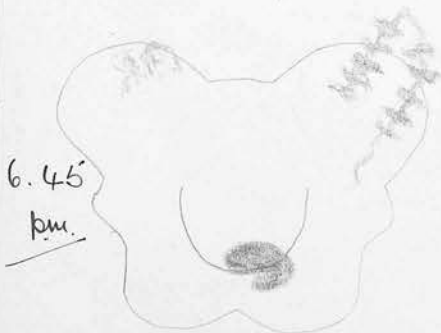
Patient was able to consume only a small.
quantity of meal.
Stomach empty within 3¾ hours.
Small intestine empty within 3¾ hours.
Part of meal present at 28 hours.
Caecum and colon fill fairly well
No evidence of ulceration
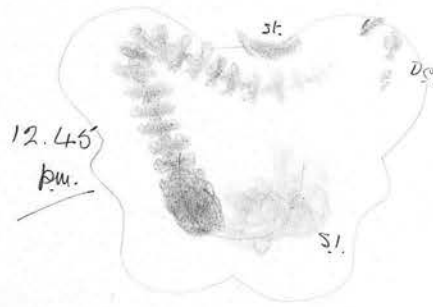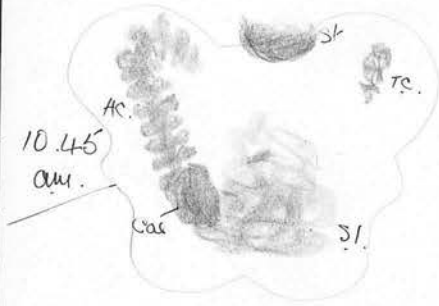
167

Barium meal 7.00 a.m.
Breakfast 8.15 a.m.

Benzidine —
Radiography —

10.45
a.m.

St.
T.C.
A.C.
Cæcum
S.I.

12.45
p.m.

St.
D.C.
S.I.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30
p.m.

S.I.

4.45
p.m.

Sigmoid

Dinner 6.15 p.m.
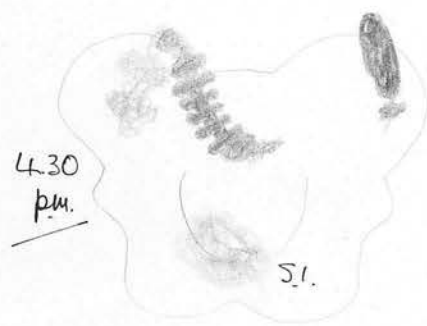Bowels opened.

6.45
p.m.

Sigmoid.

8.00
p.m.

Bowels opened

10.45
a.m.
(28 hours)

Stomach empty 6 – 7½ hours.
Small intestine empty 7½ – 9¾ hrs.
Part of meal still present at 28 hrs.
Cæcum and colon fill well – no
evidence of ulceration.

164.

Breakfast 8.15 am.
Barium meal 9.00 am.

10.50 am.
St.
AC.
Cæ'
S.I.

12.15 pm.
St.
Cæ'
S.I.

No dinner

E

2.30 pm.
St.
S.I.

4.10 pm.
S.I.

Tea 4.15 pm.

Supper. 6.30 pm.

5.45 pm.
OC.
AC.
TC.
Cæ.
Sigmoid
? S.I. also.

7.00 pm.
Sigmoid.
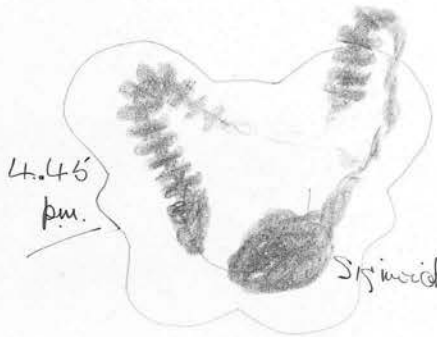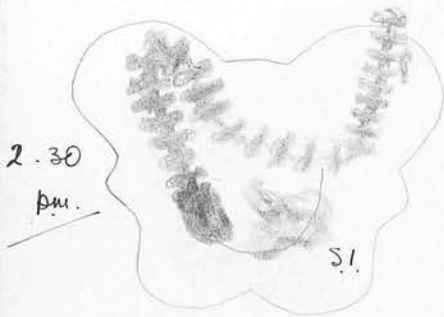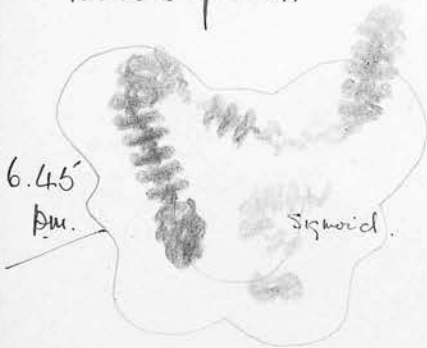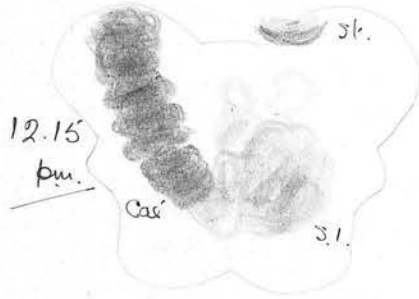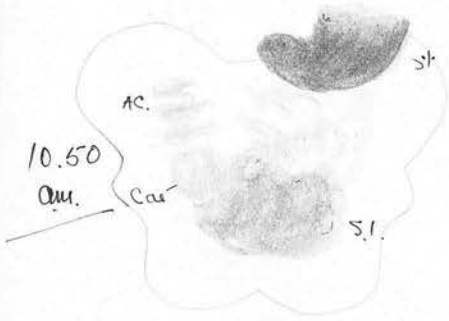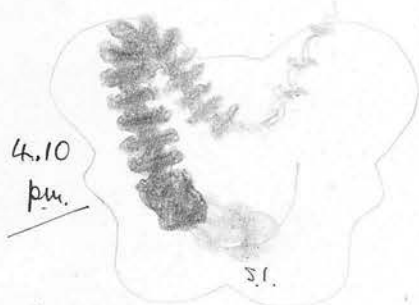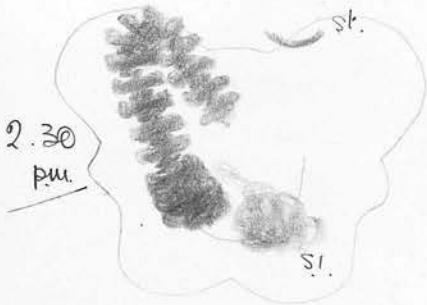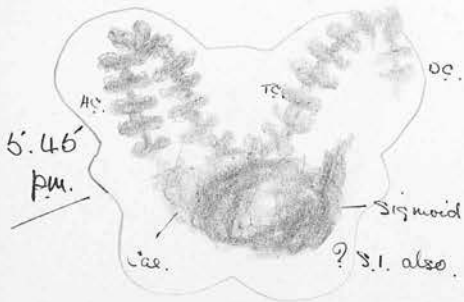
Bowels opened

Stomach empty 5½ – 7 hours.
Small intestine empty ? 7 – 9 hours
Part of meal still in sigmoid at 26 hours.

Cæcum and colon fill well – no sign of ulceration.

10.30 am.
(25 hours)
AC.
Sigmoid
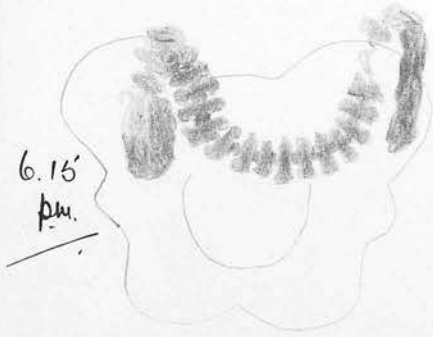
114

Barium meal 7.00 a.m.
Breakfast 8.16 a.m.

Benzidine —
Radiography —

10.45 a.m.

St.
D.C.
A.C.
Cae & S.I.

12.45 p.m.

St.
D.C.
Cae
S.I.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30 p.m.

S.I.
Sigmoid.

4.45 p.m.

Supper 6.30 p.m.

6.45 p.m.

8.00 p.m.
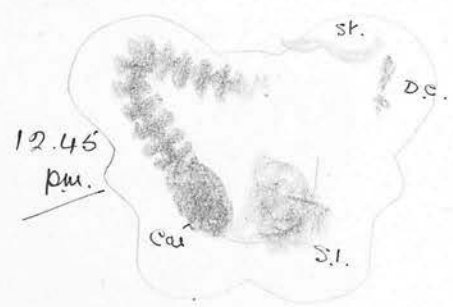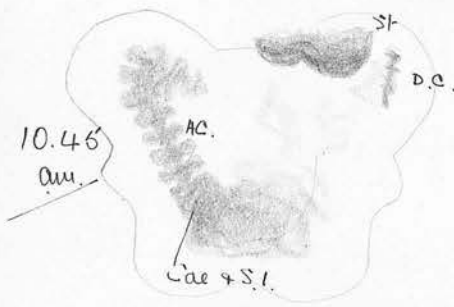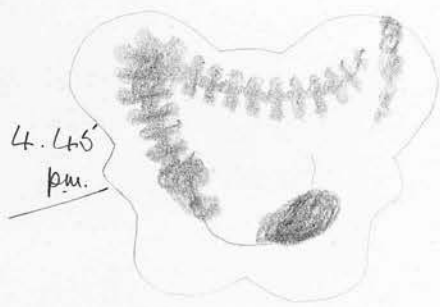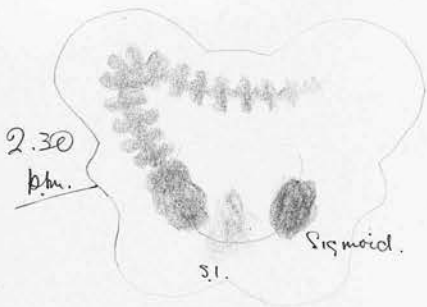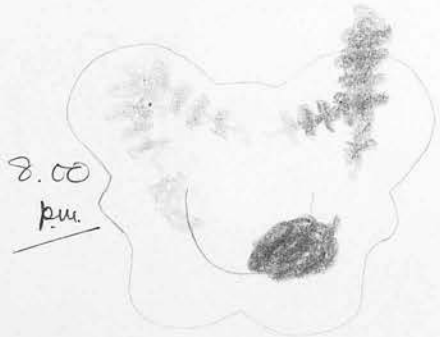
Bowels opened.

Stomach empty 5¾ – 7½.
Small intestine empty. 7½ – 9¾
Very small remnant of meal
left at 28 hours
Caecum and colon fell well
— no sign of ulceration.
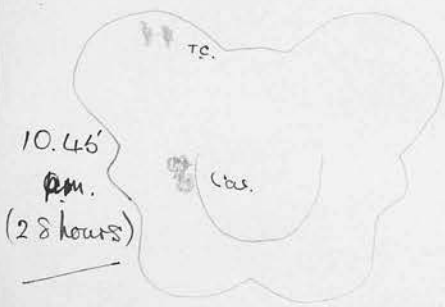
10.45 p.m.
(28 hours)

T.C.
Cae.

165.

Breakfast 8.15 am.
Barium 9.00 am.

Benzidine —
Radiography —

st. No
dinner

st.

10.40
am.

s.i.

1.50
p.m.

A.C.

cæc.

s.i.

Tea 4.15 p.m.

2.30
p.m.

s.i.

s.i.

4.30
p.m.

Supper 6.30 p.m.

5.30
p.m.

s.i.

6.50
p.m.

sigmoid
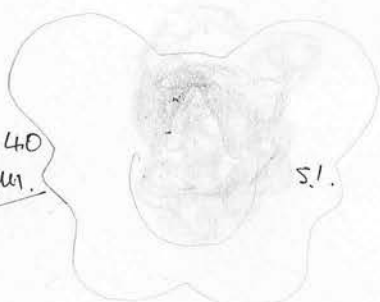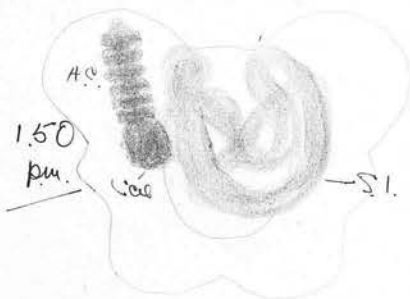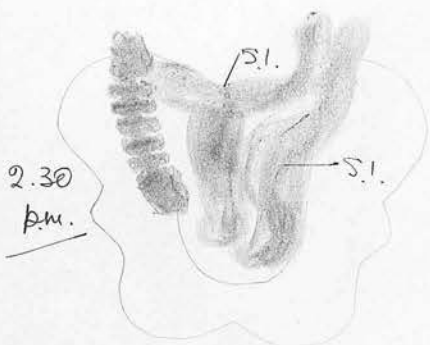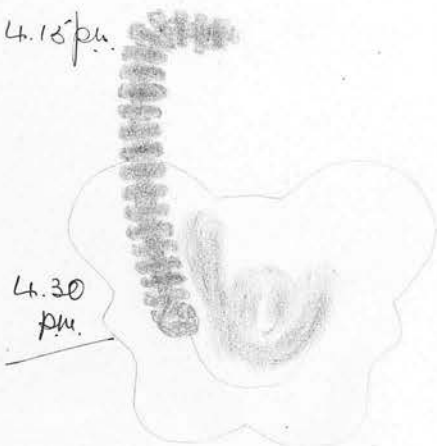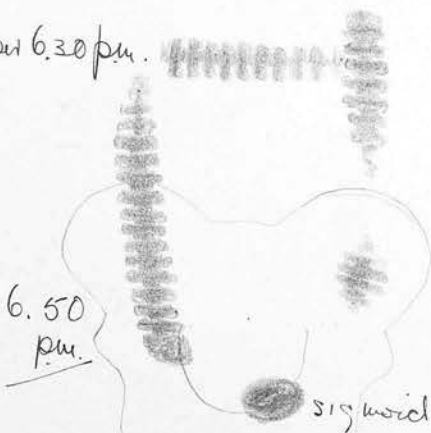
Bowels opened.
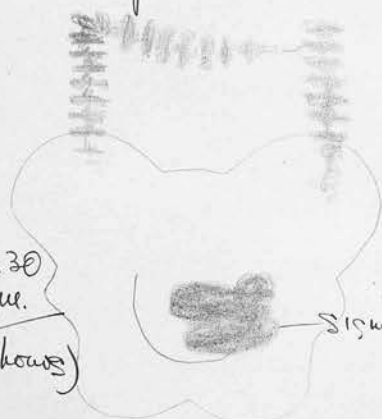
Stomach empty 4¾ – 5½ hours.
Small intestine empty. 8½ – 9¾ hours.
Large part of meal still present at 26 hrs.
No evidence of ulceration.
This case is remarkable in the manner
in which the small intestine filled and
the regularity of contour and
haustration of the colon

10.30
am.

(26 hours)

sigmoid.

120

Breakfast 8.15 am.
Barium meal 8.30 am.

C Benzidine —
Radiography —

No Dinner

st.

12.30
pm.

S.I.

2.30
pm.

Cae

S.I.
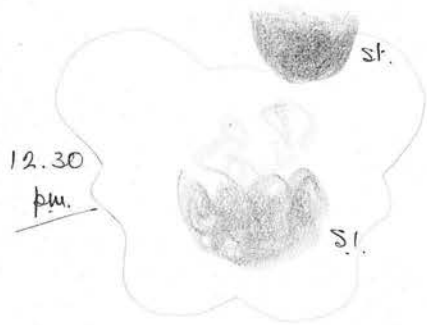
Condition in statu quo supra.
at 4.00 pm.

Tea 4.15 pm.
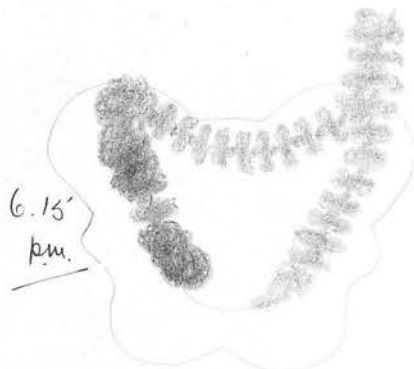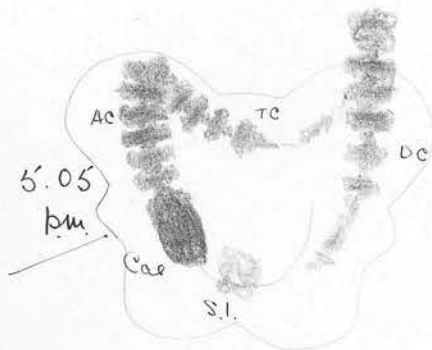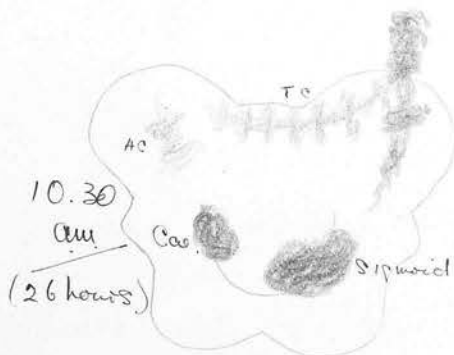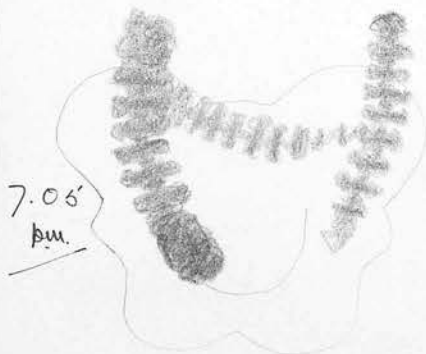
AC   TC
                DC
5.05
pm.

Cae

S.I.

6.15
pm.

Supper 6.30 pm.

Bowels opened.

7.05
pm.

TC
          AC
10.30
am.   Cae
                    Sigmoid
(26 hours)

Stomach empty 4–6 hours.
Small intestine empty 8½–9¾ hours.
Large part of meal still present at 26 hours.
Caecum and colon fill well at several views – no
evidence of ulceration.
N.B. Marked difference between the condition at 4pm and that
at 5 pm – presumably occasioned by the ingestion of
food.

69

Barium meal 9. a.m.
(Breakfast 8.15 am.)
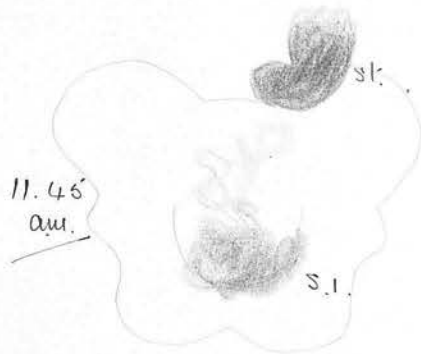
Benzidine —
Radiography

st.

10.30
a.m.

11.45
a.m.

S.I.

No Dinner

st.

Cae.

1.00
p.m.

S.I.

st.

Cae.

2.00
p.m.

Tea 4.15 p.m.

Supper 6.15 p.m.

T.C.

D.C.

Cae.

5.15
p.m.

S.I.

6.45
p.m.
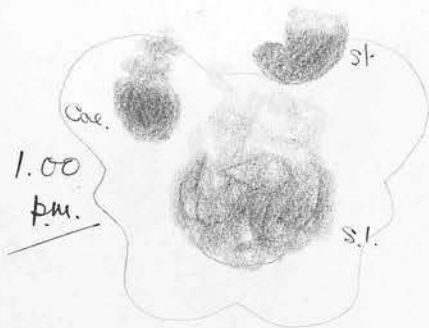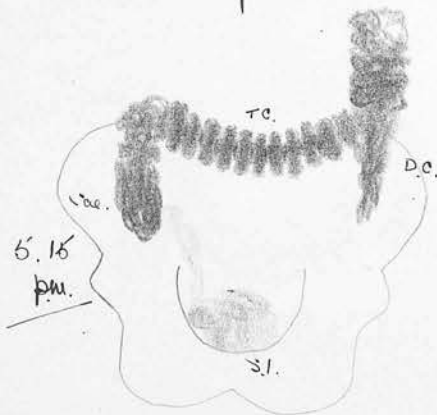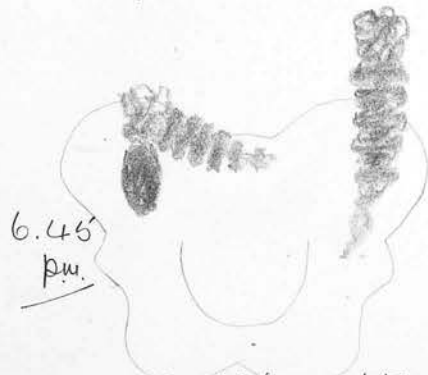
Condition practically in status quo
at 7.50 p.m.

Bowels opened.
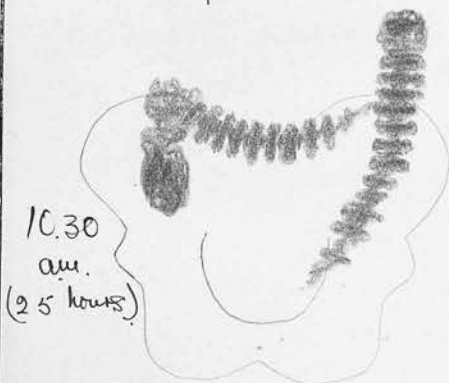
Stomach empty 5–8 hours.
Small intestine empty. 8¼ – 9¾ hours.

Greater part of meal still present at
25 hours.

10.30
a.m.
(25 hours)

Caecum and colon fill well
repeatedly — no evidence of
ulceration.
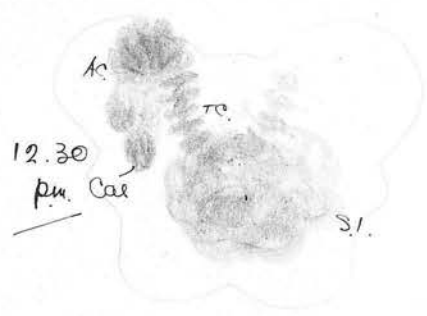
207

Barium meal 7.00 a.m.
Breakfast 8.15 a.m.

Benzidine —
Radiography —

10.30 a.m. Cae.   S.I.   S.I.

12.30 p.m. Cae.   A.c.   T.C.   S.I.

Dinner 1.00 p.m.

Tea. 4.15 p.m.

2.30 p.m.   Cae.   T.C.   S.I.

4.30 p.m.   S.I.

Supper 6.30 p.m.

6.15 p.m.

8.00 p.m.   Cae.

Bowels opened.

10.30 a.m.
(27 hours)
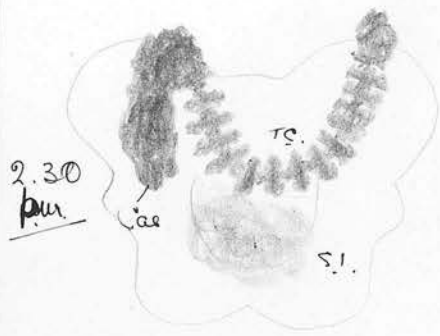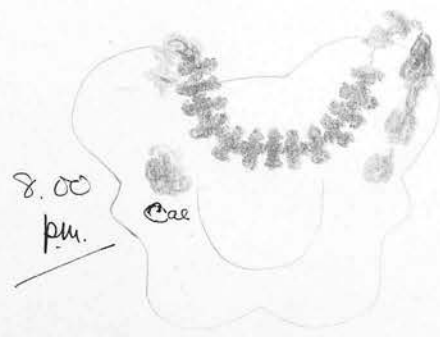
Stomach empty 3½ – 5½ hrs
Small intestine empty 9¼ – 11¼ hrs.
Minute quantity of barium left.
at 27 hours.
Here the Caecum fills poorly on
several occasions but well
on others.
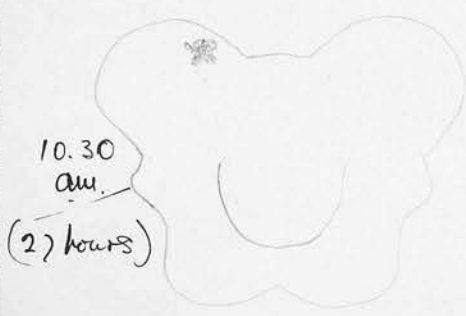
2.03

Barium meal 7.00 am.
Breakfast 8.15 am

Benzidine —
Radiography —

10.30 am.

12.30 p.m.

Dinner 1.00 p.m.
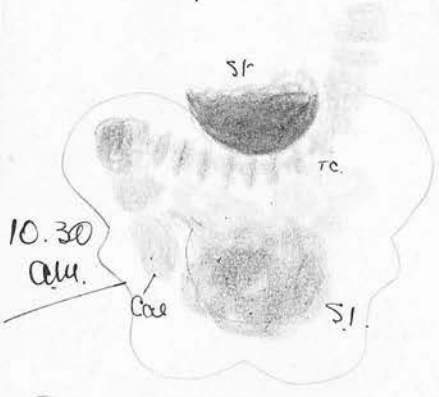
Tea 4.15 p.m.
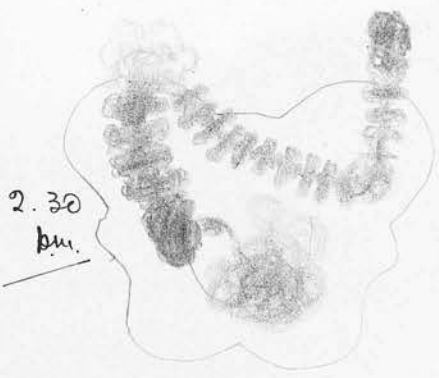
2.30 p.m.
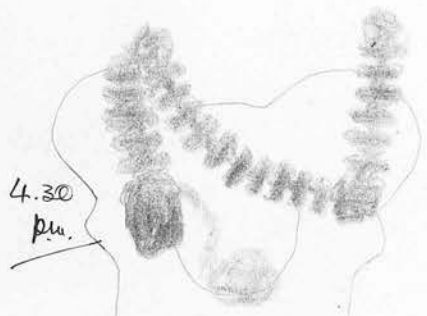
4.30 p.m.

Condition in statu quo at 6.15 pm — small quantity of meal in small intestine

Supper 6.30 p.m.

8.00 p.m.

10.30 am.
(27 hours)

Stomach empty 5½ - 7½ hours.
Small intestine empty. 11½ - 13 hours.
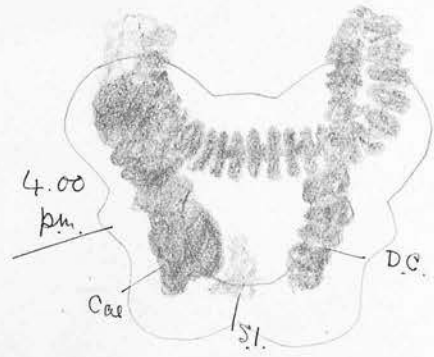Part of meal still present at 27 hours
No evidence of ulceration.

196

Barium meal - 7.00 am.
Breakfast 8.15 am.

C Benzidine —
Radiography—

10.30
am.
AC
Cae.
Ileum
S.I.
S.I.

12.30
pm.
S.I.

Dinner 1.00 pm.

2.30
pm.
TC.
S.I.

Tea 4.15 pm.

4.30
pm.
S.I.

Supper. 6.30 pm.

6.15
pm.

8.00
pm.

Bowels opened.

10.30
am.
(27 hours)
AC.
TC
TC
TC
D.C.
Cae.
Sigmoid.

Stomach empty 5½ - 7½ hrs.
Small intestine empty 9½ - 11¼ hrs
Part of meal still present at
27 hours.

No evidence of ulceration

200

Barium meal 7.00 am.
Breakfast 8.15 am.

Benzidine —
Radiography—

10.30 am.

AC.
sl.
Cae.
sl

12.30 p.m.
cae

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30 p.m.
TC
DC.

4.30 p.m.

Supper 6.30 p.m.

6.15 p.m.

8.00 p.m.

Bowels not opened.

10.30 am.
(27 hours)

Stomach empty 3½ - 5½ hrs.
Small intestine empty 5½ - 7½ hrs.
Entire meal still present at 27 hours.
No evidence of ulceration.

198

Barium Meal 7 am.
Breakfast 8.15. am

Benzidine —
Radiography —

Gas.

St.

10.30 am.

A.C.

Cae.

S.I.

12.30 pm.

Dinner 1.00 pm.

2.30 pm.

4.30 pm.

Caecum. poorly filled
but no Barium in
Small intestine

Tea. 4.45 pm

Supper. 6.35 pm.

6.30 pm.

Caecum well filled
again.

8.00 pm

Bowels opened.

Stomach empty $5\frac{1}{2} - 7\frac{1}{2}$ hrs.
Small intestine empty $7\frac{1}{2} - 9\frac{1}{2}$ hours.
Much Barium left at 27 hours.
No evidence of ulceration.
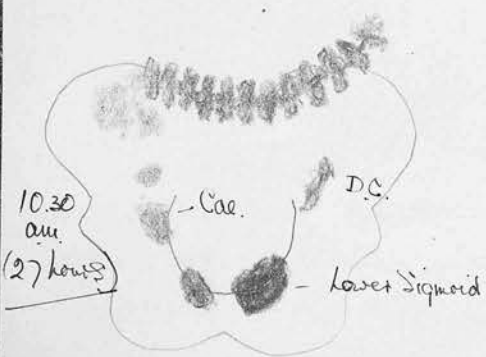
10.30 am.
(27 hours)

Cae.

D.C.

Lower Sigmoid

222.

Barium Meal 7 a.m.
Breakfast 8.15 a.m.

Benzidine —
Radiography —

Prob.
A.C
10.30
am.

?
tonic st.
S.I.

12.30
p.m.

S.I. and Cae.

Dinner 1.00 p.m.

2.30
p.m.

S.I. & Cae.

4.00
p.m.

Cae.
S.I.
D.C.

Tea 4.30 p.m.
Bowels opened. — "head" of meal
evacuated

5.45
p.m.

Cae.
D.C.

Bowels not
opened.

10.30
am.
(27 hrs)

Stomach empty 3½ – 5½ hours. Small intestine empty 9 – 10¾ hrs.
Greater part of meal still present at 27 hours.
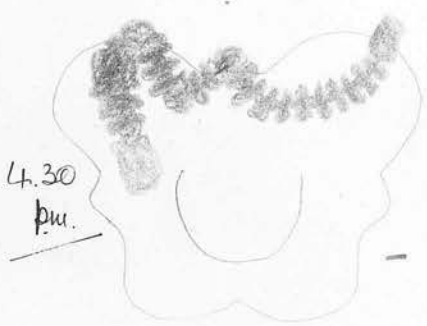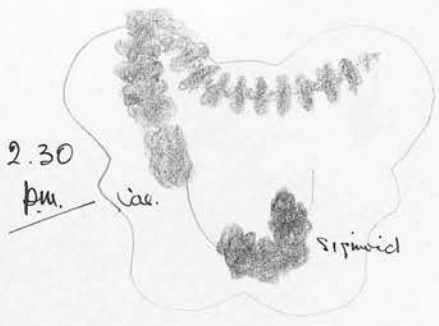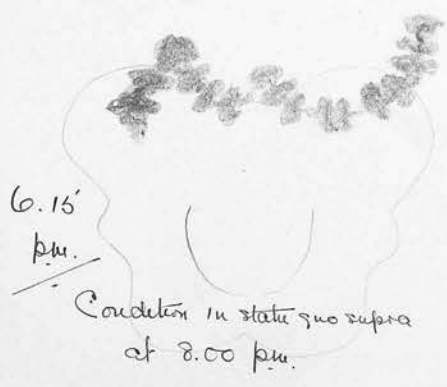Caecum and colon well filled
No evidence of ulceration.

219

Barium meal 7.00 am.
Breakfast 8.15 am.

Benzedine —
Radiography —

10.30 am. — (drawing labeled Ac., Cæc., S.I., S.I.)

12.30 pm. — (drawing labeled Cæc., S.I., D.C., Sigmoid)

Dinner 1.00 pm.

Bowels opened.
Tea. 4.15 pm.

2.30 pm. — (drawing labeled Cæc., Sigmoid)

4.30 pm.

Supper 6.30 pm.

6.15 pm. — (drawing)
Condition in statu quo supra at 8.00 pm.

10.30 am. (27 hours) — (drawing labeled Sigmoid.)

Stomach empty at $5\frac{1}{2}$ - $7\frac{1}{2}$ hours.
Small intestine empty at $5\frac{1}{2}$ - $7\frac{1}{2}$ hours.
Colon fills well — caecum fills well on two occasions
No evidence of ulceration.

Barium meal 7.45 am.
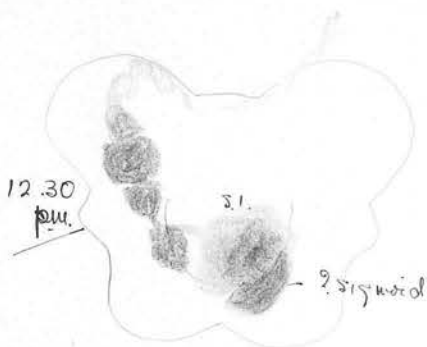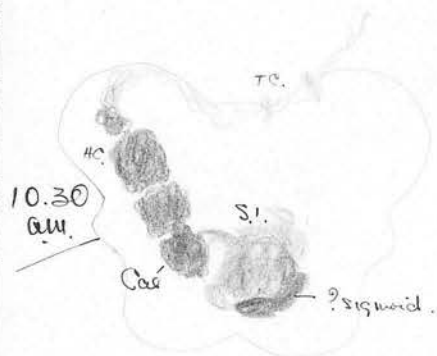Breakfast 8.15 am.

Benzidine —
℃ Radiography —

No Dinner

St.

AC.   DC.

                                TC.

12.00
noon

Cœc.

S.I.

1.00
pm.

2.00
pm.

7.00
pm.

Condition in statu quo supra at 6.00 pm.

8.00
pm.

Sigmoid

10.30
am.
(27 hours)

TC.

TC.

Cœc.

Sigmoid
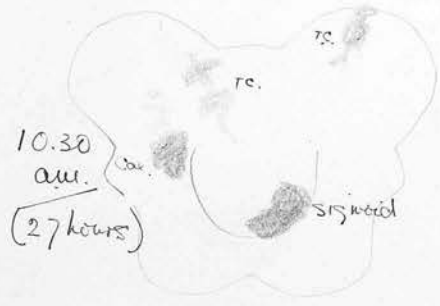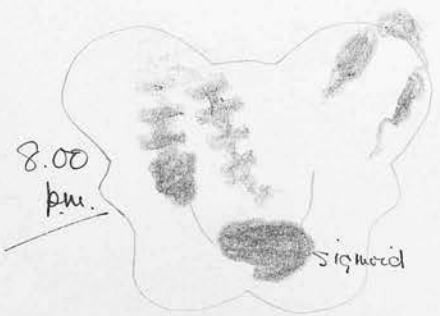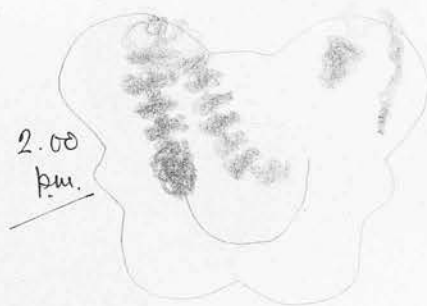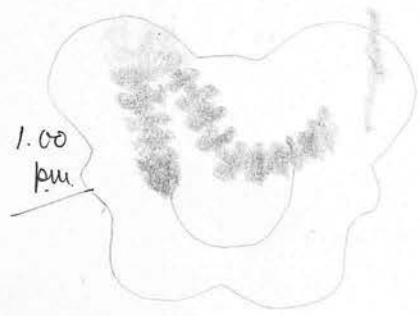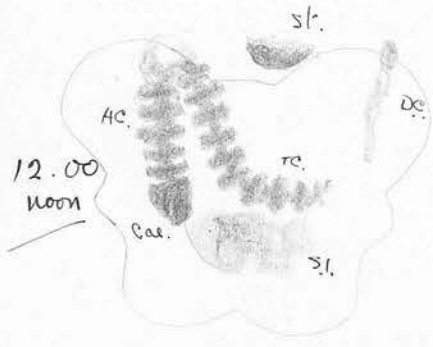
Stomach empty 4¼ – 5¼ hours.
Small intestine empty. 4¼ – 5¼ hours.
Small quantity of meal still present at 27 hours.
Caecum and ascending colon fill well in all views —
Hepatic flexure and part of transverse colon are never
filled but in such positions this is doubtful evidence
of ulceration and the negative benzidine test would
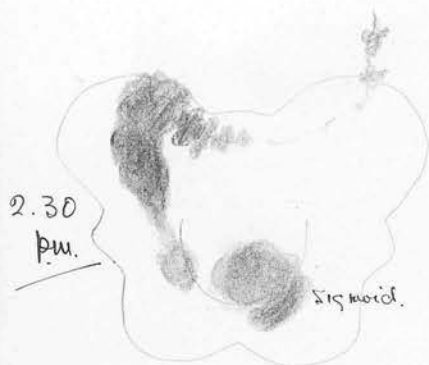indicate its absence.

96

Barium meal 7.00 a.m.
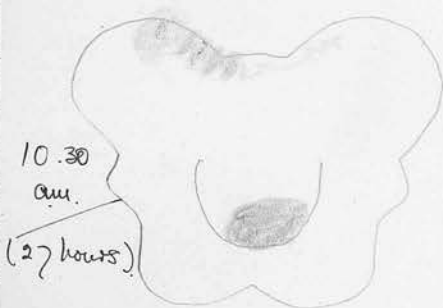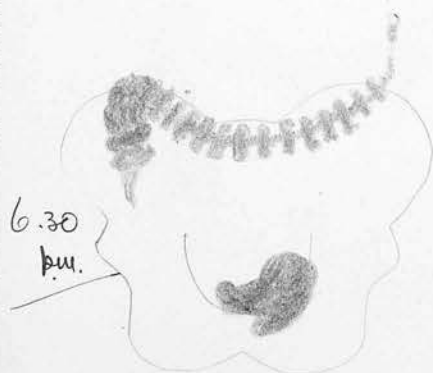Breakfast 8.15 a.m.

Benzidine —
Radiography —

10.30 a.m. — TC. HC. S.I. Cæ ?sigmoid.

12.30 p.m. — S.I. ?sigmoid

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30 p.m. — sigmoid.

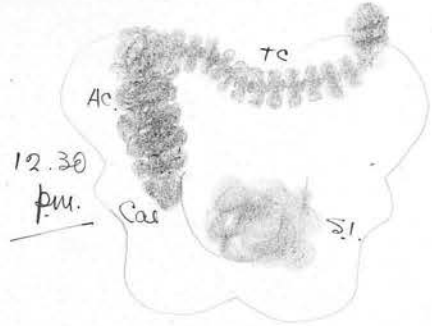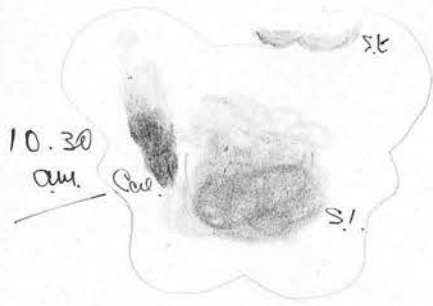4.30 p.m. — sigmoid

Supper 6.15 p.m.

6.30 p.m.

8.00 p.m.

10.30 a.m.
(27 hours)

Stomach empty within 3½ hours.
Small intestine empty. 6½ – ? 7½.
Cæcum and colon fill fairly well
at various times
No evidence of ulceration.

214

Barium meal 7.00 a.m.
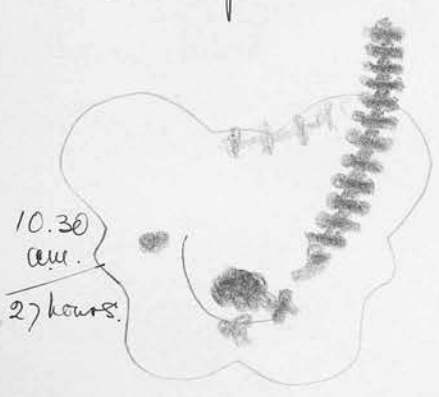Breakfast 8.15 a.m.

C Benzidine —
Radiography —

10.30
a.m.
Cae.
S.I.
S.t.

12.30
p.m.
Ac.
Cae.
S.I.
t.c.

Dinner 1.00 p.m.

Tea 4.15 p.m.

2.30
p.m.
S.I.

4.30
p.m.
S.I.

Supper 6.30 p.m.

6.15
p.m.

8.00
p.m.

Bowels opened.

Stomach empties 3½ – 5½ hrs.
Small intestine empty 9½ – 11¼ hrs.
Caecum & colon fill well.
No evidence of ulceration.

10.30
a.m.
27 hours.

Barium meal. 7.00 am.
Breakfast 8.15 am.

C. Benzidine —
Radiography —

10.30 am.
Cae
Sl.
TC.
S.I.
Sigmoid
Accessory loop of Transverse colon.

12.30 pm.
Sl.
TC.

Dinner 1.00 pm.

2.30 pm.
Sl.

Tea 4.15 pm.

4.30 pm.
Sl.

Supper 6.30 pm.

6.15 pm.
S.I.
Sigmoid.

8.00 pm.
Cae
TC.

Bowels opened.

10.30 am.
(27 hours)

Stomach not empty at 13th hour
Caecum and colon fill well.
No evidence of ulceration.

This case is notable in that
there is present an accessory loop
of transverse colon

216.