the abdomen is opened there is sudden faecal vomiting, and if the patient is deeply under the anaesthetic some of the vomit gets into the lungs and causes a fatal broncho-pneumonia. This can be guarded against by passing a stomach tube directly the patient is unconscious, and before commencing the operation. The stomach may be either washed out or allowed to drain during the operation, and washed out before the patient leaves the table. A still better method is to do the operation under local or spinal anaesthesia, so that the coughing reflex is not abolished. The prevention of toxic shock is more difficult. The administration of large quantities of water or saline so as to dilute the poisons and encourage their elimination is most important, but this is not easy. If the patient is not being sick it can be administered by the mouth, but if there is sickness this is impossible, and if the obstruction is low down rectal salines will probably not be retained. It is often necessary to give subcutaneous, or intravenous, saline, and this should always be done in a bad case before or during the operation. Glucose, or some other form of sugar, should also be given by the most convenient route.

As regards the operation itself, all surgeons are agreed that "to get in quick and get out quicker"—the famous motto of the late Professor Murphy of Chicago—is even sounder in cases of acute obstruction than it is in cases of acute peritonitis, for which it was originally invented. One should do the least possible that will relieve the obstruction and leave direct interference with the lesion to a subsequent operation when the patient has got over the toxæmia which has been produced by the obstruction. Some years ago, at Bristol, Mr. Burgess and I advocated blind caecostomy in these cases as the best treatment, and there is still considerable difference of opinion on this question. The advantages of blind caecostomy are that it can be performed under local anaesthesia through a small incision with the absolute minimum of interference with the abdominal cavity, and that it completely drains the whole of the colon above the obstruction and rapidly gets rid of the toxæmia. The opening, if made by the tube method, which I suggested in 1922 (*Lancet*, 1922, ii, 1117), will remain open for ten days to a fortnight and will close itself without a secondary operation. This gives time enough to perform a second operation to deal with the obstructing lesion. It has been urged against blind caecostomy that it does not enable a diagnosis to be made of the obstructing lesion, but this is not a serious objection, as it is not the lack of an exact diagnosis that is threatening the patient's life, but the obstruction. It has also been pointed out that if the obstructing lesion is a volvulus it will not be relieved by a blind caecostomy. This is a more serious objection, but volvulus only accounts for about 1 per cent. of cases of obstruction, and in any case it is generally fatal. It was pointed out by Mr. Burgess that if it can be proved that the mortality from acute obstruction of the colon can be reduced materially and as a whole by blind caecostomy, this is sufficient justification for its adoption.

While surgeons still hold different views as to the advantages of blind caecostomy in cases of colonic obstruction they all agree that a colostomy or caecostomy should be performed above the site of obstruction, and the actual obstructing lesion should not be dealt with at the time, but be left till after the obstruction has been relieved. On no account should any attempt be made to resect the obstruction or to short-circuit it. An occasional successful result from such a procedure is no justification for the very serious risk involved. The subsequent treatment of the patient should aim at getting rid of the toxæmia by freely administering water in some way or another and relieving the overloaded bowel. It is

generally better to evacuate the bowel by means of enemata given through the artificial opening rather than by administering purgatives by the mouth.

CONCLUSIONS

1. It should not be difficult to diagnose obstruction of the large bowel from that of the small.
2. The commonest cause of obstruction of the colon is a growth in the pelvic portion, and the next commonest diverticulitis in the same region. It should be possible to diagnose the cause of the obstruction with only a small percentage of error.
3. The chief danger and the most frequent cause of death is the toxæmia which results from the obstruction. This can be best dealt with by the free administration of fluids.
4. The best operation for relieving the condition is blind caecostomy or colostomy performed under local anaesthesia.

A QUANTITATIVE MODIFICATION OF THE BENDIEN REACTION IN SERO- DIAGNOSIS OF MALIGNANCY*

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In 1931 Dr. S. G. T. Bendien of Holland published his observations in "Specific changes in the blood serum," and introduced a flocculation test which he claims, with certain reservations, differentiates between normal and pathological serums by variations in the reaction. Although he details many reaction changes which occur with malignant serums, the test is not primarily put forward as specific for cancer. The Bendien test consists of two parts: the first, a chemical precipitation of proteins from a serum by a specially arranged series of acetic acid sodium vanadate mixtures, and secondly, the spectrographic examination of the precipitated protein. The observations and conclusions of the second part of the test are based upon technical findings of a specialized kind, and have been criticized by Smith, Holiday, and Marrack (1931), whose findings have so far not been refuted. The first (precipitation) part of the test has also been questioned by Fine (1932), but this adverse criticism is tenable only so long as the reaction is restricted to the use of unheated serum, which, as will be shown later, is an insufficient employment of the test.

After carrying out over two hundred tests upon various serums, nearly all Bendien's flocculation reaction observations upon human serums, and several upon animal serums, have been confirmed. The delicacy of the precipitation reaction is striking, and necessitates a carefully standardized technique; but this gives to it a degree of differentiation between serums, and of variations from time to time in the serum of the same case, which suggest that the test has a definite clinical value.

Several of the difficulties which were met with, and observations which were made in doing the precipitation test, suggested that a quantitative estimation of the deposits would give more concise findings than the qualitative readings suggested by Bendien, and the following is a brief description of the modified quantitative method that has been employed, and upon which the subsequent findings are based.

The Reagents.—The first eight mixtures of N/10 acetic acid and N/10 ortho-sodium vanadate are prepared accord-

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ing to Bendien's detailed description. The vanadate used has been obtained from the British Drug Houses, Ltd. Difficulty occurs from the fact that the composition of sodium vanadate varies considerably. Fresh batches of reagents have so far been standardized against those previously used by employing pooled "normal" serums, so as to maintain a correct sequence of reactions. Experiments are being made, however, to improve upon this method of standardization.

The Serum.—Ten c.cm. of blood is required, obtained from the patient in a fasting condition. The serum should not be haemolysed—after standing it is centrifuged clear of cells. Fine's suggestion of using only 0.1 c.cm. of serum in each reaction tube economizes serum.

The tubes must be standardized—75 mm. in length and 7 to 8 mm. internal diameter. Gross variations cause considerable alterations in reaction.

Delivery of the small quantities of serum and reagents employed demands absolute accuracy; for this reason rheometer syringes (John Weiss and Co.) are used.

TECHNIQUE

For the modified test now to be described each serum is divided into three portions and marked accordingly. Approximately 1 c.cm. is required for each part.

"A" is the portion to be used *unheated*. It is carefully diluted with an equal quantity of distilled water, well mixed, and 0.2 c.cm. of the mixture is delivered into each of eight tubes; the respective reagents are added—Reagent 1 to the first tube, Reagent 2 to the second, and so on—the mixtures well shaken, and put aside to settle for sixteen to twenty-four hours. "B" is the portion to be *inactivated by heating* in a water bath for half an hour at 56° C. "C" is the portion in which the lipid-protein complex is to be *dissociated by ether*. For this purpose at least half as much ether is added as there is serum, the whole being thoroughly shaken in a well-corked tube and set aside to separate out. This will occur as a layer above the cleared serum.

FIG. 1.—Types of Bendien Reactions.

1.	First precipitation with Reagent 8	
2.	"	6 (Normal).
3.	"	4
4.	"	2
5.	Full	1

The following day the "A" (unheated serum) tubes are examined. The reactions vary from *nil* in which the contents of the tube are quite clear, to a complete precipitation of all protein contents of the serum, which is shown by a heavy deposit lying below a water-clear, supernatant fluid. Between these two extremes every variety of turbidity and less or more precipitation may be found. Examples of the marked variability in reaction of different serums are shown in Fig. 1. Two rows of

tubes are now placed in the rack behind the "A" series. Into the first of these rows 0.2 c.cm. of diluted "B" (heated) serum is placed, and into the second row 0.2 c.cm. of diluted "C" (ether-treated) serum, which has been carefully pipetted from below the ether layer and then diluted. To each tube 1 c.cm. of the respective reagents is added, all being shaken and allowed to stand, as in the case of the "A" series. From each serum a series of the "A," "B," and "C" reactions are obtained. The result in the "B" and "C" series may differ markedly in certain cases, according to the amount of thermolabile substance inactivated by heating and to the dissociation effect produced by ether on the serum con-

(1) Non-malignant.

(2) Malignant.

FIG. 2.—Three-phase Reaction with Unheated, Heated, and Ether-treated Serums.

(1) A.	First precipitation in Tube 5	(2) A.	First precipitation in Tube 5
B.	"	B.	"
C.	"	C.	"

tents. Fig. 2 shows the tubes from two cases obtained as described above and the deposits obtainable for quantitative estimation.

ESTIMATION OF DEPOSIT

The visual readings of the deposits, although they show a move to the right of varying amount in the "B" (heated serum) and a move to the left, most marked in malignancy, in the "C" (ether-treated serum) reaction, are not sufficiently accurate for quantitative estimation, and the following method is therefore employed. The tubes are centrifugalized at about 1,000 revolutions per minute and the supernatant fluid carefully removed without disturbing the deposit. The deposits are dissolved by adding, to each, 2 c.cm. of N/100 NaOH, and the resulting solutions vary in concentration according to the amount of precipitate dissolved in each. By means of the Löwe interferometer (1910), as made by Zeiss, these concentrations are read in units, using a 5 mm. observation chamber, and by experimental estimation it is found each unit corresponds to 0.025 mg. A reading, therefore, of 40 units equals 1 mg. of precipitate, and this amount obtained from 0.1 c.cm. of serum equals a 1 per cent. precipitation. Experimentally this amount of deposit is found to be that which usually appears visually as the "first precipitation," and it was therefore arbitrarily taken that a quantitative estimation of 40 units (or nearest above) should be regarded as the "first precipitation" and the reaction classified by the reagent number in which this amount of deposit is first found.

INTERPRETATION OF FINDINGS

The tube of the "A" series in any case which gives the first reaction having been determined, the unit measure thus obtained is taken as the basal figure for the computation of that serum, and the corresponding "B" and "C" deposits are similarly estimated, with the result that from these values in interferometer units a fraction may be worked out in which the numerator is calculated

by subtracting the unit value of "A" from "C" and the denominator by subtracting "B" from "A."

FIG. 3.—Quantitative Estimation of Precipitates.

Reagent	6 A	B	C	6 A	B	C
Interferometer units of deposit	40	20	45	59	57	109
Fraction $\frac{C-A}{A-B}$	= 5/20			= 50/2		
	= Non-malignant.			= Malignant		

For instance, as shown in Fig. 3, the first case—a normal serum—gives:

Precipitation in Tube 6 in A (unheated serum)	= 40 interferometer units
" " 6 in B (heated ")	= 20 " "
" " 6 in C (ether ext. ")	= 45 " "

The result is expressed as:

$$\begin{aligned} & \frac{6.C - A/A - B}{= 6.45 - 40/40 - 20} \\ & = 6.5/20 \end{aligned}$$

Similarly, in the second instance—the serum of an early case of carcinoma of the cervix—the findings, while also giving a primary precipitation in Tube 6, show in the "B" and "C" reactions entirely different results, giving a fraction greater than unity—namely, 6.50/2.

In cases where the thermolabile effect is marked and the increase of precipitation after ether treatment is slight (as is found in normal or non-malignant inflammatory conditions) the fraction is less than unity. Conversely, when the thermolabile effect is slight or absent, and the precipitation after ether treatment increased or high (as is found in malignancy), the resulting fraction is equally consistently greater than unity, and this differentiation holds good irrespective of whether the first "A" reaction occurs in the lower or in the higher numbered tubes. Normal serums, as a rule, show a first precipitation with Reagent 6. Non-malignant infective and malignant conditions may show a first reaction in any of the series, according to the severity of the pathological condition. This is shown in Table I, which also demonstrates how the quantitative diagnostic formula or

TABLE I.—Examples of Reaction Readings

First Precipitation in Tube	Reaction Formula		Clinical Diagnosis
	Malignant	Non-malignant	
1	1.30/1	—	Carcinoma of rectum—advanced
	—	1.30/35	Enlarged prostate, sect. non-malig.
2	2.50/25	—	Carcinoma of tongue; glands +
	—	2.15/30	Gall-stones, cholecystitis, non-malig.
3	3.27/14	—	Carcinoma of stomach
	—	3.16/26	Gastric ulcer
4	4.30/20	—	Carcinoma of uterus; gland in groin
	—	4.34/50	Ovarian cyst, non-malignant
5	5.40/26	—	Carcinoma of cervix, Stage II
	—	5.15/35	Uterine prolapse, simple
6	6.40/5	—	Carcinoma of sigmoid, early
	—	6.0/30	Chronic colitis with achlorhydria
7	7.57/10	—	Carc. breast early; no axillary glands
	—	7.8/35	Chronic mastitis; sect. non-malig.
8	8.44/23	—	Carc. cervix; radium 14 months
	—	8.10/20	Dysmenorrhea, simple; section neg.

fraction differentiates malignant from non-malignant reactions of varying types.

NATURE OF REACTION

The different degree of precipitability in the "A" reaction (unheated serums) probably depends upon an alteration of the normal albumin-globulin ratio, the globulin fraction being increased in malignancy (as shown by Guthmann and Platz in 1930), and also upon variations in the amounts of calcium, magnesium, and potassium present in the serum (as found by Gunther and Greenberg in 1930), or alterations in the electric charges carried by these electrolytes and the proteins associated with them (as suggested by Bendien in 1931 and Pierron in 1932).

The alterations in the "B" reaction, produced by heating or inactivation of serums, are probably also a biochemical result, in which part of the globulin is denatured or labilized, and thereby rendered no longer precipitable as formerly. This feature of the test, described as "normallabilin" by Bendien, is found most marked in septic and infective conditions, where there is evidence of good resistance or immunizing response—usually less marked in normal serums, less still in infective conditions of poor resistance, and, as a rule, least of all in malignant cases. An increase of this thermolabile feature of the reaction has been observed to follow the removal of a malignant growth in some cases, and more especially the successful local destruction of a growth, such as a carcinoma of the cervix uteri by radium, as if the process had stimulated an increase in globulin lability. It may be associated with an immunizing response. Possibly the experimental work of Lumsden (1932) and the observations of Casport (1929) may offer an explanation not only of the clinical improvement in certain cases as the consequence of the autolysis of cancer cells and the absorption of disintegration products resulting from such treatment, but also of the spontaneous cure in occasional instances.

The variations in the subsequent precipitation of the "C" reaction may depend in part upon the lipid content of malignant serums being higher than normal (Benso, 1930)—these observations, however, have not been confirmed—but more probably upon the findings that in malignancy the lecitho-protein-globulin association is in some way locked up and rendered more stable, possibly by the saturation of fatty acid radicles. The ether treatment dissociates this abnormal stability of the protein constituents of the serums, and allows of the greater precipitability in the "C" reaction in malignancy as compared with non-malignant serums similarly treated. In his book Bendien mentions the importance of observing the effect of heating serums, and also describes the increased precipitability after ether treatment, though he does not emphasize that the combined estimation of these reactions is essential to a sero-diagnosis. The modification of the test here introduced utilizes his original flocculation technique, but insists upon its essential employment in the three phases (of unheated, heated, and ether-treated portions of every serum), while a quantitative estimation of the precipitates obtained by any one reagent after treating the serum in this threefold manner provides differentiating data.

The variety of reaction which is consistently associated with cancer shows, according to the degree of malignancy, a combination of these three features in which the altered precipitability of the unheated serum proteins is the most variable, and the decreased labilization and abnormal lipid-protein complex are the most constant. In this connexion the valuable work of Shaw Mackenzie (1911, 1912, 1913), confirmed by Lewis (1928), is of special interest. Possibly the deficiency in serum lipolytic power

accounts for the abnormal lipid-protein complex demonstrable in malignant serums. In the diagnosis of malignancy the quantitative estimation of the inactivation and ether effects upon the serum is of greater importance than the variations in primary tube precipitation. The latter, however, expresses the degree of malignancy if the two former observations indicate its presence.

CLINICAL RESULTS

This quantitative estimation has been carried out on more than one thousand occasions. Many were "repeat" examinations of the same case; others were experimental observations, and have been excluded from the 600 examinations the results of which are presented as illustrating the diagnostic value of the test.

Out of the total there were 362 cases of various degrees of malignancy, ranging from the most advanced and obvious to the earliest and clinically uncertain type. These included carcinoma of the tongue, jaw, lip, etc., 42; stomach and oesophagus, 26; colon, rectum, appendix, and sigmoid, 75; lung and larynx, 24; uterus and cervix, 91; ovary, 13; breast, 49; gall-bladder, 2; bladder and kidney, 4; prostate, 4; scrotum, 9; glands, 1; skin, 14; pancreas, 2; brain, 2; and sarcoma, 4. Of these, 349 tests gave malignant, and 13 (3.7 per cent.) non-malignant reactions. Of clinically non-malignant cases there were 238, including 92 normals. Of these, 226 gave non-malignant, and 12 (5.3 per cent.) malignant reactions, a total clinical non-correspondence of 25 (4.25 per cent.) out of 600 cases. The majority of these examinations were made without knowledge of the condition of the cases. The clinical details were supplied later, when it was found that the discrepancies between the test findings and clinical conditions of the cases concerned were more apparent than real.

Table II details twenty-five cases of non-correspondence. The first eight were of cases clinically non-malignant. In these the "first precipitation" took place with Reagents 6, 7, or 8, and, as far as the tube reaction is concerned, did not indicate active malignancy, but all gave a malignant type of fraction, and may indicate a pre-cancerous tendency. All were over 40 years of age.

In another group of 134 cases which were clinically normal or suffering from simple medical or surgical conditions of a non-malignant type, all over the age of 36 years, twelve gave first precipitation in Tubes 6, 7, or 8, but of the malignant type, and this 9 per cent. of "possibly precancerous cases" is suggestively near the percentage of cancer incidence.

In the next group, Cases 9 to 18 in Table II, all ten showed "first precipitation" with reagents lower than No. 6, and therefore, as far as the tube reaction goes, in the more malignant zone. In all of them definite cancer with more or less gross secondary septic infection was present. In Cases 12, 14, and 17 the patients were actually dying of secondary sepsis. When the clinical condition is revealed the apparent non-correspondence of the test as regards malignancy in these particular cases is open to the explanation that at the time of examination the cases were more septic than malignant. Case 19 was one of Hodgkin's disease, and there are probably many who may consider that a malignant reaction in such a case is not incorrect. If possible clinical explanations are allowed there are left six cases (1 per cent.) out of 600 which are not explainable, with the possible exception of Case 22, which, retested eight days later, still gave a Tube 7 reaction, but of a malignant type.

The diagnostic accuracy of the Bendien test appears, therefore, to approximate 95 per cent. if the clinical condition is not taken into account, and 98 per cent. if it is.

TABLE II.—Details of Cases not corresponding in 600 Examinations

Case No.	Reaction		Clinical Conditions
	Malignant	Non-malignant	
1	6.47/33	—	Chronic appendix after appendicectomy
2	6.60/25	—	Menopausal menorrhagia and hyperplasia
3	6.42/38	—	Subserous fibroids—section negative
4	6.57/20	—	Pyloric ulcer and hyperchlorhydria
5	7.60/15	—	Duodenal ulcer
6	7.35/5	—	Gastro-intestinal toxæmia
7	7.45/20	—	Marked anaemia secondary type; occult blood in faeces + + +
8	8.50/40	—	Menorrhagia, non-malignant; section neg.
9	—	5.4/40	Radium burn; epithelioma and local inflammation
10	—	5.26/50	Rodent ulcer face, healing; septic infection
11	—	4.14/35	Carcinoma of cervix, fungating type; infiltrating pelvis
12	—	4.18/43	Carcinoma of oesophagus; obstruct. and purulent bronchitis and bron. pneumonia
13	—	4.5/13	Carcinoma of antrum and septic absorption
14	—	3.17/30	Carcinoma of oesophagus and inflammatory infiltration
15	—	3.30/50	Carcinoma of pelvis; inflammatory reaction
16	—	2.14/42	Carcinoma of cervix and local pelvic infiltration and pyometra
17	—	1.7/46	Carcinoma of pharynx, extensive suppuration, lung abscess
18	—	1.11/50	Carcinoma of rectum (scirrhous). Intestinal stasis
19	2.30/5	—	Hodgkin's disease
20	—	4.17/51	Adenocarcinoma of ovaries
21	—	6.10/20	Carcinoma of breast, early scirrhous type, glands +
22	—	7.15/17	Carcinoma of cervix with chronic endocervicitis
23	6.60/25	—	Fibro-adenoma of breast. No malignancy found
24	4.38/40	—	Enlarged prostate
25	1.37/8	—	Aortic aneurysm, abdominal. No malignancy found

THE TEST IN PROGNOSIS

Details of fifty cases of uterine carcinoma show a close correspondence between the degrees of clinical malignancy and the positiveness of the serum reaction. Some overlapping occurs between the test findings in the three groups clinically arranged according to the League of Nations I, II, and III grades, as might be expected; precisely similar correspondence was found in a further series of fifty cases of mammary carcinoma. A point of interest is that in twelve out of fifteen cases of carcinoma of the cervix treated by radium and deep x-ray therapy, and in five out of eleven cases of carcinoma of the breast treated surgically—all of which show no evidence of recurrence and are clinically satisfactory—the serum reaction is of the non-malignant type. In all the others, whether of advanced or early malignancy, or of clinically satisfactory conditions, the reaction is of the malignant type. A comparison of the Wassermann and Bendien reactions was made in thirty cases (in fifteen of which the Wassermann was positive), and the Bendien reaction was non-malignant in all but three. In the latter early conditions of malignancy were found—in one carcinoma of the cervix, another of the prepuce, and in the third of the larynx. All were unsuspected clinically, but confirmed later by section. A small group of six cases of pregnancy have been examined, ranging from an ectopic gestation of six weeks to a nine months' pregnancy, and in each case the reaction was positive and malignant in type. The test would therefore be of no value in attempting to differentiate malignancy from pregnancy, or to diagnose malignancy in a pregnant woman. This finding emphasizes the fact that many of the endocrine and serological changes physiologically present in pregnancy are apparently similar

to those pathologically present in malignancy. This suggests that there is present some loss of the normal inhibition of growth-stimulating hormones, as described by Susman's observations (1931), and is in keeping with the hypotheses of Blair-Bell.

Over one hundred cases of various types and degrees of malignancy have been re-examined at approximately monthly intervals in many cases, and less frequently in others.

Cases of inoperable cancer have usually shown a steady increase in positiveness of reaction, the first precipitation of the serum in the tube series moving more or less steadily to the left, and usually reaching a full precipitation in Tube 1 shortly before death. Reactions of the lower tube types usually indicate a hopeless prognosis. In some cases comparatively small and clinically more malignant growths have shown a more positive reaction and a more rapid increase of positiveness than has been found in cases of larger and more extensive neoplasms. This suggests that the test findings may indicate variations in individual resistance to malignancy, rather than have any relation to the size of the mass of cancerous tissue. Cases of scirrhous carcinoma—especially the atrophic type in elderly patients, in whom clinically the malignancy is little more than a local manifestation, or at worse very slowly progressive—have given reactions of a mildly positive type, and in one a negative result. Cases in which the primary growth has been satisfactorily removed, and in which metastases have not developed, usually show a fairly rapid move of the first precipitation to the right in subsequent tests.

In several cases of mammary carcinoma complete removal has been followed by an alteration of the serum reaction from a definitely positive to a non-malignant type, while in others recurrence after a similar operation has been associated with a persistence of the malignant fraction in spite of temporarily improved tube reactions. Later, a move back to the left in tube precipitation has accompanied or preceded the development and progress of recurrence of the growth or the formation of metastases. In three cases the serological diagnosis of recurrence anticipated the clinical findings by from one to three months. It thus appears possible that in post-operative cases of malignancy and those under radium and x-ray treatment such means of observing serum alterations may give information with regard to clinical progress and the probability of recurrence or metastases developing, and may indicate the need for repetition of treatment, if such were possible, or suggest, by reason of a change to a reaction of a non-malignant character, that treatment might be safely omitted.

In *Some Aspects of the Cancer Problem* (Blair-Bell, 1930), the statement is made that "immense importance would be attached to the discovery of a reaction that will indicate the presence of cancer cells left after a radical operation, or after a supposed cure by any means at our disposal, or that will demonstrate the development of a recurrence at a later date." I suggest that the Bendien test as described, while not necessarily indicating the presence of cancer cells, does indicate the existence or non-existence of biochemical and biophysical conditions which would allow of the development or recurrence of cancer cells. It therefore comes somewhere near to the fulfilment of the hope that is expressed in this quotation.

On these grounds it would justify itself for serious consideration, as an aid to clinical diagnosis, and probably even of more importance as a method of making post-operative "follow-up" observations upon known cases of cancer, and assessing thereby the clinical value or otherwise of suggested methods of treatment whatever their character.

CONCLUSIONS

1. A quantitative method of employing Bendien's flocculation reaction is described, and the results of 600 tests detailed.

2. The primary tube reaction alone is shown to be insufficient for the diagnosis of malignancy. The triple test must be employed, and will then differentiate malignant from non-malignant conditions in at least 95 per cent. of cases.

3. The clinical malignancy and the degree of positiveness shown by the test closely correspond.

4. Post-operative cases of cancer, or those having radium, x-ray, or other forms of treatment, may be "followed up" by means of this test, and clinical information may thereby be obtained regarding prognosis and treatment.

5. Cases are referred to in which satisfactory clinical improvement and apparent cure is associated with the continued presence of a normal or non-malignant serum reaction.

6. In some cases the serum reaction has foretold a recurrence months before clinical observations have confirmed it.

7. Among normal and clinical non-malignant conditions a certain percentage of abnormal reactions occur, suggesting the possibility of recognizing in such cases a pre-cancerous tendency.

8. The test is delicate and reliable, more satisfactory as a laboratory technique than any other at present available, and should be of value as a clinical aid to diagnosis and prognosis of malignancy, especially in early cases.

My sincere thanks are due to the many colleagues who have made this work possible—to Dr. Bendien, for his criticism and appreciation of the modified application of his test; to Dr. Gemmell and Mr. Malpas for the provision of a large number of serums and, later, full clinical notes from cases at the Royal Infirmary, David Lewis Hospital, and Radium Institute, etc.; to Dr. MacWilliam and his staff at Walton Infirmary for supplies of serums and clinical details; and to several colleagues at the Eye and Ear Infirmary, Liverpool, the Hahnemann Hospital, Liverpool, and the Southport Infirmary, for the opportunity of conducting tests and examining their cases; also, to my two assistants P. H. Osmond and L. H. Bennett, who have carried out a considerable part of the experimental and routine work.

Since writing this paper an article by Professor Gomes da Costa of Lisbon (*Arq. de Patologia*, 1932, iv, 1) has appeared upon "The Bendien Test for the Diagnosis of Cancer," in which the author confirms many of Bendien's findings both in the flocculation test and also in the spectrophotographic examinations. A further paper by Beggs and Aitken (*Journ. Exp. Path.*, 1932, xii, No. 6) has appeared on "The Effect of Tumour Regression on Serum," and confirms from an experimental aspect upon animals that variations in the Bendien reaction and lipolytic power of serum are associated with development of, or regression in, malignant neoplasia.

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