CLINICAL PATHOLOGY IN GENERAL PRACTICE

DISPATCH OF SPECIMENS

BY

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The clinical pathologist is a bridge between the laboratory and the clinician, and can function only if he is as familiar with the patient's state as with his laboratory investigations. It is possible to churn out mechanical reports on swabs from unknown sources and blood from unknown diseases, but this is technicians' work, not pathologists'. Only when the pathologist is informed of the clinical aspects of the case can he select the most appropriate means of investigating the material sent to him, and interpret his findings to suggest a diagnosis or further investigations. The minimum information sent with every specimen should be:

The patient's name, age, and sex.

The source of the material, and when it was taken.

The investigations required.

The essentials of the clinical history, including details of any chemotherapy.

The probable diagnosis.

When the case is difficult the pathologist and clinician should at least consult by telephone, and should preferably meet at the bedside.

It is easy to forget to label a specimen, and thus to destroy all certainty that the pathological report truly belongs to the patient in question. The patient's name and the date and time of taking the specimen are essential, but it is wise to add to the label some other details, such as the patient's age or the doctor's name, in case, as not infrequently happens in busy laboratories, two patients of the same or very similar names are being investigated at the same time.

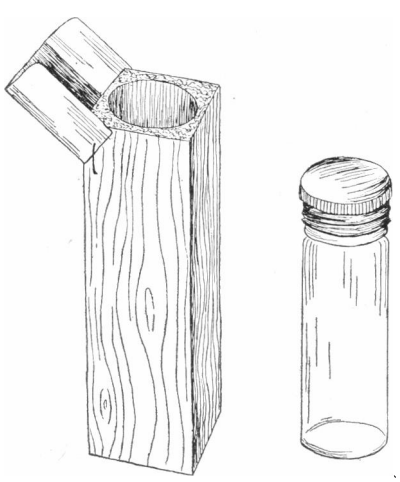

FIG. 1.—Bottle for liquid specimen, with wooden container.

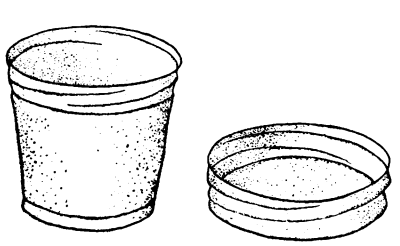

FIG. 2.—Waxed cardboard container for faeces or sputum.

Containers

Only four types of container, some throat swabs, and glass slides are needed for the great majority of specimens for pathological examination. All can usually be borrowed from the laboratory that will perform the investigations, for it is not reasonable to expect the general practitioner to clean and sterilize his own glassware. But, if he must, glass containers are most conveniently sterilized at home by using the ordinary domestic pressure-cooker as an autoclave: 20 or 30 minutes' cooking at full pressure is adequate.

Liquid specimens should be placed in sterile wide-mouthed screw-capped bottles (Fig. 1); corks too readily come out in transit. Three types are required:

1. Plain sterile 1-oz. (28-ml.) bottles to contain blood for serum, urine, and other fluids for culture, etc. Wash the bottles well but do not use detergents, which grossly interfere with the Wassermann reaction and some other tests. Dry thoroughly and sterilize in the pressure-cooker with the caps lightly screwed on the bottles.

2. Oxalate bottles, for most biochemical estimations on blood. Add a knife-point of sodium or potassium oxalate to a plain bottle prepared as above.

3. Wintrobe bottles for blood counts and E.S.R. (sedimentation rate) determinations. In a sterile ¼-oz. (7-ml.) screw-capped bottle, prepared as above, place 0.2 ml. of a solution containing 2 g. potassium oxalate and 3 g. ammonium oxalate in 100 ml.; evaporate to dryness in a warm but not hot place. A bottle thus prepared is for 5 ml. blood.

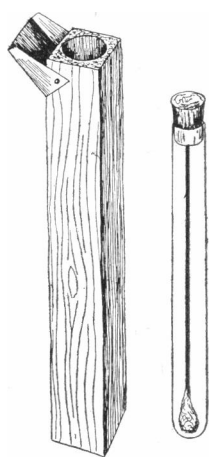

FIG. 3.—Throat swab tube, with wooden container.

Faeces and *sputum* are best sent to the laboratory in waxed cardboard containers (Fig. 2) which can be burnt after use. These containers need not be sterilized.

Throat swabs can be purchased prepared ready for use, together with suitable containers for the post (Fig. 3). They should be sterilized before use (unless obtained from a laboratory) by pressure-cooking for 30 minutes.

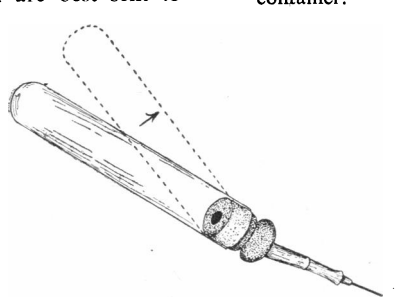

FIG. 4.—Behring venule. The dotted line shows the position when the vacuum is released.

Glass slides can be used straight from their box. If they are washed they should be dried with a freshly laundered grease-free linen cloth. There is no advantage in storing them in spirit.

Less frequently used containers, such as bottles of broth for blood culture, fluoride tubes for blood-sugar estimations, and jars of formalin solution for histological material, will certainly be supplied by the laboratory when they are required.

The *Behring venule** (Fig. 4) conveniently replaces both syringe and container. It comprises a vacuum tube to which is attached a sterile needle protected by a sealed glass covering. When this covering is removed the vacuum is preserved by a simple valvular arrangement until, when the needle is

* Obtainable from Bayer Products Ltd., Africa House, Kingsway, London, W.C.2.

in the vein, the needle is flexed on the tube. When the valve is thus opened blood is drawn into the container. Venules are prepared to correspond to the plain bottles, oxalate bottles, and Wintrobe bottles described above, as well as one containing glucose broth for blood culture. Containers suitable for postal delivery can be obtained with the venules.

Specimens for Bacteriological Examination

The proper selection of material for bacteriological examination often demands a little thought. For example, pathogens are always present in the advancing edge of a lesion, whereas they may have died out in the necrotic centre.

TABLE I.—*The Viability of Common Pathogenic Organisms on Swabs, etc.*

VERY RESISTANT (Survive for days or weeks)
- Staphylococci
- Streptococci
- *Bact. friedländeri*
- Diphtheria bacillus
- Tubercle bacillus
- *Actinomyces bovis*
- Anthrax bacillus
- Clostridia (tetanus, gas-gangrene, etc.)
- Viruses
- Rickettsia (typhus, etc.)
- Fungi
- *E. histolytica* cysts

VERY DELICATE (Survive at most a few hours when dry)
- Meningococcus
- Gonococcus
- *T. pallidum* (syphilis)
- *E. histolytica,* vegetative forms
- Trichomonas

INTERMEDIATE (Survive two days or more)
- Pneumococci
- *Bact. coli*
- Salmonellae (typhoid and food-poisoning)
- Shigellae (dysentery)
- Haemophilus (whooping-cough, *H. influenzae*)
- Brucella (abortus and Malta fever)

With a few exceptions (Table I) pathogenic bacteria readily survive the normal time of transit to the laboratory. Drying and exposure to sunlight are the most deleterious factors; chilling does little or no harm. Even gonococci and *Trichomonas vaginalis* survive for two days or more in Stuart's transport medium, which keeps them moist while suspending their animation by lack of oxygen. A further disadvantage of delay is that saprophytic bacteria may multiply in the specimen at room temperature and come to outnumber the pathogens. The pathologist can often counteract this process by the use of selective media, but it is better to avoid it. Finally, it is necessary to remember that sulphonamides and antibiotics may suppress causative bacteria without curing the patient. If specimens are not taken before starting treatment diagnosis may be greatly delayed or even made impossible. If specific therapy has already been started, this fact should be noted.

Blood Culture.—Many bacteria are rapidly killed by the patient's undiluted blood (the typhoid–paratyphoid group are an exception). Blood for culture should therefore be diluted immediately in bottles of the appropriate medium, using about 7 ml. blood to 50 ml. medium. Ordinary broth suffices for most bacteria, but *Str. viridans* prefers glucose broth. If rarer infections are suspected (for example, meningococcal septicaemia or brucellosis) the pathologist should be asked to supply the most appropriate medium. Special media, containing *p*-aminobenzoic acid, are also required if the patient is receiving sulphonamide therapy.

Blood culture demands a careful but not an elaborate technique. The patient's arm need be cleaned only as for any venepuncture, and sterile towels are not needed. The most common sources of contamination are imperfect sterilization or careless handling of the syringe and needle, repeated attempts to enter a vein, a leaky syringe, or careless exposure of the broth while the blood is added.

Faeces.—Faeces are best carried to the laboratory in a waxed cardboard container, which can be burned. A rectal swab is as efficient as faeces for the bacteriological diagnosis of bacillary dysentery, and may save valuable time in the diagnosis of enteric fever when faeces are not available. Helminth ova are generally found in faeces, but it must be remembered that threadworm ova are deposited outside the bowel on the perianal skin. They readily adhere to a piece of "cellophane" rubbed gently over the skin; the cellophane is sent to the laboratory in a screw-capped bottle.

Pus.—A throat swab of the pus, with a smear if more than an hour or two's delay is likely, is sufficient for the diagnosis of pyogenic infections. If tuberculosis or actinomycosis is suspected, 5 or 10 ml. of the pus should be sent to the laboratory in a sterile 1-oz. (28-ml.) screw-capped bottle.

Hairs.—The infected stubs of hair in ringworm infection need to be carefully chosen. Lengths of hair broken or snipped off are quite useless, for the infection is in the hair root. It is best to send the stubs to the laboratory in a piece of white paper folded in the manner of a chemist's powder packet.

Scales.—Scales of skin may be sent to the laboratory in a paper packet like hairs (above) or may be enclosed between glass slides held together by rubber bands. The scales must be chosen from the advancing edge of the lesion, not from the centre.

Pleural Fluid (and other serous fluids such as ovarian or ascitic fluid) should be sent to the laboratory in a sterile 1-oz. (28-ml.) screw-capped bottle. A part should also be sent in an oxalate bottle for cytological examination. If *malignant cells* are to be looked for the fluid should be diluted with at least an equal volume of 10% formalin solution (see next page).

Sputum is best carried to the laboratory in a waxed cardboard container, which can be burned. An early-morning specimen is best, but the patient should be reminded that saliva is useless. Sputum to be examined for carcinoma cells should be sent to the laboratory as promptly as possible. Formalin or other fixatives are deleterious.

Swabs.—The ordinary throat swab is a convenient means of sending a variety of materials to the laboratory for bacteriological examination. Most bacteria survive well on the swab (see Table I), but good smears cannot be made if it has dried. A smear should therefore be made on a slide (sterilized in the flame and cooled) if more than a few hours' delay is likely. Pernasal swabs, passed through the anterior nares along the floor of the nose to the nasopharynx, are at least as efficient as post-nasal swabs, as well as being less troublesome to take.

Urine.—A mid-stream specimen of urine from the male suffices for bacteriological examination, but a catheter specimen must be obtained from females if culture is required. In doubtful cases the women need not be subjected to the discomfort of catheterization until microscopy of an ordinary specimen of urine has revealed the presence of pus. Examination for tubercle bacilli should always be made on an early-morning specimen of urine. A 24-hour specimen is often desirable if it can be carried to the laboratory. An early-morning specimen is also required for pregnancy tests.

Haematology and Serology

Blood in ordinary oxalate bottles is of little use for any haematological examination except a simple haemoglobin estimation. Blood for counts and E.S.R. determinations should be placed in Wintrobe bottles. The amount of anticoagulant used is near the minimum, so the blood and oxalate must be thoroughly mixed by repeated inversion of the bottle at intervals for two or three minutes. Even the Wintrobe oxalate mixture soon distorts leucocytes; therefore two or three blood smears should be sent with the

specimen. It is important to remember that a too-thin blood smear always gives some information whereas one that is too thick may be completely useless. A smear is generally too thick if it does not peter out before the end of the slide. Blood in Wintrobe bottles can be used for haemoglobin determinations and red-cell counts for at least two days after taking the blood, but the leucocyte count begins to fall after a few hours and may be misleadingly low after 24 hours. The sedimentation rate is also spuriously low at periods greater than three hours after taking the blood.

Blood Grouping (including the Rh factor) is best done on blood allowed to clot in a plain bottle. The specimen must arrive at the laboratory within 24 hours of withdrawal if rhesus antibodies are to be sought for.

Blood for Serological Tests.—Blood for the Wassermann reaction, Widal reaction, and other serological tests should be allowed to clot in a sterile screw-capped bottle. Contamination of the blood should be avoided. Haemolysis, whether from water or spirit in the syringe or from bacterial contamination, vitiates the W.R. and many other tests. Blood from infants for the W.R., etc., is simply obtained by pricking the well-warmed heel and allowing the blood to flow into a Wright's capsule (Fig. 5).

FIG. 5.—Wright's capsule.

Biochemical Estimations

The majority of biochemical estimations on blood can be performed with either serum or plasma from oxalated blood. Serum is generally preferred to plasma, and is essential for a few estimations (Table II). Wintrobe bottles should not be used for blood for biochemical determinations; in particular, blood from them cannot be used for urea determinations. Most biochemical determinations are valid if done within a day or two of the withdrawal of the blood; the exceptions are indicated in Table II. The *blood sugar* can be satisfactorily estimated after 36 hours if fluoride is used instead of oxalate.

TABLE II.—*Containers for Blood for Biochemical Estimations (Minimum quantity of blood 1 ml. except where indicated)*

PLAIN OR OXALATE BOTTLES
Bilirubin (minimum 2.5 ml. blood)
*Chlorides
Cholesterol
*CO_2-combining power (minimum 5 ml. blood)
Non-protein nitrogen
Phosphatase (acid or alkaline)
*Phosphates (minimum 2.5 ml. of blood)
Proteins (minimum 2 ml. of blood)
*Sugar
Urea
Uric acid
PLAIN BOTTLES ONLY
Serum calcium (minimum 5 ml. of blood)
*Serum potassium
*Serum sodium
Thymol turbidity

* Estimations marked thus must be made within two hours of withdrawing the blood.

Faeces for the occult blood test should be sent to the laboratory in the same way as bacteriological specimens. Other biochemical tests on faeces, urine, etc., are rarely needed in general practice. If any should be required, the advice of the laboratory should be sought before sending the specimen.

Histological Examinations

Material for histological examination must be sent to the laboratory in a fixative solution, otherwise autolysis may make interpretation of the sections impossible. The most generally used fluid is a 10% aqueous solution of commercial formalin. Screw-capped jars of all appropriate sizes can be obtained. Larger pieces of material should be wrapped in gauze before being placed in their container.

Postal Regulations

Every effort should be made to send pathological specimens to the laboratory by hand, thus eliminating delay and minimizing the possibility of loss or breakage. The Post Office regulations permit pathological specimens to be sent by *letter* post to a recognized medical laboratory or a qualified medical practitioner. Sending such specimens by parcel post is absolutely prohibited. The material must be placed in a securely closed container, which must itself be enclosed in a strong wooden or metal box in such a way that it cannot shift about, and with sufficient sawdust, cotton-wool, or other absorbent packing to prevent any possible leakage from the parcel in the event of damage to the container. The packet must be conspicuously marked "Fragile with Care" and bear the words "Pathological Specimen." Figs. 1 and 3 illustrate examples of containers and outer boxes that comply with the regulations.

Next Article on Clinical Pathology.—"Venepuncture," by Dr. I. A. B. Cathie.

Refresher Course Book.—The first collection of articles in the Refresher Course for General Practitioners (fully revised) are available as a book containing 55 chapters, price 25s. Copies can be obtained either direct from the Publishing Manager, B.M.A. House, Tavistock Square, London, W.C.1, or from booksellers.

PREVENTION OF TRANSFUSION ACCIDENTS

CONSULTING PATHOLOGISTS' GROUP CONFERENCE

The Consulting Pathologists' Group Conference was held at B.M.A. House on September 30. Professor D. F. CAPPELL was voted to the chair. Dr. J. G. GREENFIELD, Chairman of the Group Committee, presented its report, which was approved.

Dr. GEORGE DISCOMBE opened a discussion on blood transfusion, its dangers, and the precautions which should be taken. The form of the problem was determined to a large extent by one's clinical colleagues. It sometimes happened that blood had to be provided in a hurry, perhaps several times in a day. Since 1946 in his department they had transfused about 14,000 bottles. Some 6,000 patients had received blood, and among those 6,000 only about 6% had developed some sort of reaction. Ten recognizable haemolytic reactions were found. In two of these no cause was discovered; eight were ABO incompatibles. He had been brought up to believe that in many cases of incompatibility death ensued, but in the cases of incompatible transfusion experienced in his department there had been no deaths.

For a long time they had used capillary blood for grouping and found it satisfactory. But their technicians had been instructed to look for the slightest deviation from the normal, and if this happened they immediately sought advice and help. Mistakes were analysed, and it was found that three mistakes were due to hurry, two were due to blunders made by an inadequately trained member of the laboratory staff who gave out blood to the wrong patient, and one was due to a nurse who had not read a label on the bottle. Laboratory administration had since been tightened up so that fewer people handled the blood, and recently a unit-recording system had been introduced. Thus mistakes were obviated whereby in one case two women with the same surname, one called Margaret and the other