4. *Tuberculous Ulceration of the Bowels.*—This is generally secondary to pulmonary disease, resulting from the swallowing of infected sputum. In children it can occur as a primary infection, and is then usually associated with severe involvement of the mesenteric glands. In either case diarrhoea is the most striking symptom.

5. *Intestinal Obstruction.*—This may result from ulceration of bowel, or from kinking and narrowing of its lumen through peritoneal adhesions.

6. *Acute Peritonitis.*—This is simulated occasionally when an intestinal ulcer perforates into the surrounding adhesions, or when a tuberculous gland breaks down completely or becomes infected with other organisms.

Clinical Manifestations.

The symptoms depend largely on the part first and most severely affected, but generally they are gradual and insidious. The child's strength is noticed to be failing; he is pale and thin, feverish at night, and the abdomen is progressively enlarging. The appetite is capricious, the stools are often unhealthy, and there may be alternating constipation and diarrhoea. Attacks of colic are not uncommon, and when associated with vomiting may be mistaken for subacute appendicitis. In those cases which simulate acute peritonitis the onset of symptoms is very abrupt, with high temperature, vomiting, acute abdominal pain, and generalized tenderness and rigidity. When the acute inflammation is principally confined to the ileo-caecal glands, this tenderness and rigidity is localized to the right iliac fossa, and the condition closely resembles acute appendicitis. The adhesive type may so constrict the intestines and interfere with their normal movements that partial obstruction results; the intestinal coils stand out in relief under the abdominal wall, and peristalsis may be seen. In certain mild cases there are repeated feverish attacks at intervals of a few months, and little else is noticed at the time except slight abdominal distension. Enlarged glands or tuberculous masses, sometimes mistaken for the liver, can usually be felt in the abdomen at some period of the disease, but these may be masked by the presence of ascites. When suppuration occurs the abscess always tends to point at the umbilicus.

The outlook is certainly favourable in the absence of any severe tuberculosis elsewhere, and patients who have received prompt and energetic treatment recover completely. No case should be despaired of, since the disease rarely proves fatal, and then only in very feeble children. The infection is more dangerous in infants, in whom it is apt to spread beyond the abdomen.

Treatment.

The patients must live in the open air day and night, and remain flat in bed so long as ascites continues, the temperature is raised, or there are any other symptoms present. The general resistance is increased by giving as much nourishment as possible without upsetting the digestion. Milk, cream, eggs, butter, plasmon, raw meat juice, and raw meat sandwiches should all be included in the diet; but if they are not tolerated, and cause flatulence and curdled stools, fats must be restricted and milk may require peptonizing. Starchy foods are contraindicated, and if the appetite is poor or the digestion weak, alcohol in the form of brandy or brandy egg-flip should be given. Cod-liver oil is valuable, but cannot be added to the diet unless the stools are normal and there is no diarrhoea.

A belladonna and glycerin liniment (1 to 4) applied to the abdomen on lint is helpful in easing pain. Various applications are also said to be useful in the treatment of the actual disease, but, with the possible exception of iodoform ointment (10 per cent.) and mercury ointment (B.P. strength), they are of little value.

Irradiation of the abdomen by natural sunlight or ultra-violet rays is undoubtedly beneficial. If the ascites continues to increase, its removal may become necessary by means of a small trocar and cannula or Southey's tubes; but the best method of drainage is through a fairly long incision under general anaesthesia. Surgical removal of tuberculous abdominal glands is an unsuccessful procedure when there are any considerable number, and in adhesive

tuberculous peritonitis surgery is positively dangerous and liable to liberate the contents of the bowel into the abdominal cavity. It is equally unwise to interfere with a tuberculous abscess until it is actually on the point of bursting through the umbilicus.

TUBERCULOSIS OF THE EAR.

Chronic discharge from the ear in children is more commonly due to tuberculous infections than is usually supposed. Any aural discharge in a suspected case of tuberculosis should be examined, since the chance discovery of tubercle bacilli may just give the required confirmatory evidence. There are few subjective symptoms, and the ear continues to discharge profusely, despite ordinary methods of treatment. The lymphatic glands in the vicinity of the mastoid soon become infected and finally break down. In addition, there may be facial palsy as a result of involvement of the facial nerve as it passes through the middle ear. In the treatment efforts are made to eradicate the disease completely by surgical means, but this is often unsuccessful and the outlook is generally unfavourable.

TUBERCULOUS MENINGITIS.

No disease in the whole of paediatrics can appear in so many unexpected ways as tuberculous meningitis and lead to such confusion. The illness has no classical picture, and such physical signs as do appear often arise so late that they give no help towards an early diagnosis. Little reliance should be placed on Koenig's sign, as it is very inconstant and its absence in no way precludes the presence of tuberculous meningitis. Severe headache, persistent vomiting, prolonged pyrexia, gradual change of temperament, drowsiness, or a sudden fit followed by unconsciousness are all possible modes of onset. Should any of these occur after infancy and have no other explanation, tuberculous meningitis should always be borne in mind. Two physical signs that I have found most useful in a doubtful case are enlargement of the spleen and a unilateral extensor response. The ultimate diagnosis will, however, depend upon examination of the cerebro-spinal fluid, and, once established, the prognosis is invariably fatal.

CONCLUSION.

Let me emphasize once again the importance of prophylaxis. The prevention of contact with human sources of infection, the proper sterilization of milk, the maintenance of a high standard of general bodily health, and the provision of adequate country or seaside convalescence after any severe infection are the best safeguards we can give a child against tuberculosis.

CERTAIN ASPECTS OF THE DIAGNOSIS AND TREATMENT OF DIABETES.*

BY

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In the past the identification of a reducing substance in the urine sufficed for the diagnosis of diabetes. Varying degrees of severity were recognized, but anyone presenting a urine which reduced Fehling's solution was regarded as suffering from diabetes of greater or lesser severity. That parturient women and nursing mothers frequently showed sugar in the urine was early recognized, but it was some time before it was realized that this sugar was lactose and that its presence lacked any particular significance. Later it was discovered that the urine of certain persons otherwise in normal health contained pentose, which reduces Fehling's solution in the same manner as glucose. For the diagnosis of diabetes it was then deemed only necessary to demonstrate that the reducing substance in the urine was neither lactose nor pentose, the former being readily excluded by the yeast fermentation test with which it gives a negative result, the latter by Bial's reaction.

* A paper read before the South Staffordshire Division of the British Medical Association at Walsall on March 21st, 1929.

The diagnosis of diabetes thus came to depend upon the demonstration of glucose in the urine. All patients consistently showing glucose in the urine on an ordinary diet were regarded as diabetics.

TYPES OF BLOOD SUGAR CURVE.

It was long ago shown that the glycosuria of diabetes is dependent upon the presence of an unusually high percentage of sugar in the blood; in the absence of any easy means of examining the blood sugar level, however, it was not possible to apply this knowledge to the differentiation of the various types of glycosuria. With the invention of quick and simple means for measuring the blood sugar, such as those devised by MacLean, Folin, Benedict, and many others, it became feasible to estimate the blood sugar clinically, and it then became apparent that the percentage of sugar in the blood is subject to fluctuations according to the stage of digestion. In normal persons the blood sugar between three and four hours after a meal falls to a level of somewhere between 80 and 120 mg. per cent., which may be known as the fasting level. On the ingestion of food, particularly of starchy food, it rises rapidly to from 180 to 200 mg. per cent., and then falls rapidly again, reaching the original fasting level in between one and a half and two and a half hours.

In diabetics the behaviour of the blood sugar is quite different. In the first place, even after a prolonged fast, the level is usually much above the normal fasting level. On the ingestion of food it rises rapidly to a level far above that ever attained in normal persons, and stays up. It is this persistence of a high blood sugar after the ingestion of food which characterizes the diabetic—in other words, it is the shape and not the height attained by the blood sugar curve which is diagnostic of diabetes. In partially treated cases the fasting level of the blood sugar may be normal, and even after the ingestion of glucose it may rise only just above the level to be expected in a normal person; but having risen, there it stays, thus making clear the diagnosis of diabetes.

The blood sugar in normal persons can hardly be made to rise above from 180 to 200 mg. per cent. If it be induced to do so sugar is excreted in the urine. The blood sugar level at which sugar is excreted in the urine is known as the "renal threshold" for glucose. In some persons otherwise quite normal this renal threshold may be lower than usual, their condition, which is without clinical significance, being usually known as "leaky kidney" or "renal glycosuria." Yet another type of glycosuria which must be distinguished from true diabetes is found in some persons in whom, after the ingestion of sugar, the blood sugar rises steeply to an abnormal level, but thereafter falls to the fasting level in the normal time. This is a comparatively rare condition, and its significance is obscure; in view of the fact, however, that persons in whom it is found often pass acetone in the urine it would seem to indicate a definite disturbance in carbohydrate metabolism and to demand a careful observation of the patient.

It is obvious, then, that the mere presence of sugar in the urine cannot be looked upon as establishing a diagnosis of diabetes. An examination of the fasting blood sugar, taken from three to four hours after the last meal, is also necessary. If this shows a high blood sugar the diagnosis is more or less complete; if the blood sugar is at, or not much above, the normal level, a glucose tolerance estimation and a blood sugar curve can hardly fail to establish the diagnosis one way or the other. Further evidence must be sought in the presence or absence of the ketone bodies, acetone and diacetic acid. Their presence along with sugar is strongly indicative of the existence of true diabetes; in their absence diabetes, even if present, is probably of a mild type. The presence of acetone in large amount is a danger signal; the presence of diacetic acid in any amount is a call for instant and vigorous treatment.

PROBLEMS IN THE TREATMENT OF DIABETES.

Everyone who has seen more than one case must recognize that diabetes varies enormously in severity. It is a commonplace that it is severe in the young and that the later in life it develops the more benign it becomes. The presence or absence of the ketone bodies serves as some

indication of severity or benignity. Much information can also be derived from the appearance of the patient. The young or middle-aged patient, showing a dirty tongue, complaining of polyuria and thirst, and showing signs of recent loss of weight, is obviously in a more dangerous state than the elderly, apple-faced, and obese individual, boasting of a hearty appetite, and in whose urine sugar has been discovered by chance only. In the former class the indications for immediate and vigorous treatment are obvious; in the latter it must be decided how far one is justified in meddling with a regime upon which the patient feels perfectly well. The existence of pruritus, neuritis, or ocular or cardiac trouble of any sort is a distinct indication for treatment; if, in the absence of these conditions, patients choose to go their own way, they should always be warned of the danger of gangrene.

Treatment of diabetes has practically only one object in view—namely, to reduce the work of the islet cells of the pancreas to a level with which they can cope. The islet cells seem to be peculiar among the cells of the body in that they are only just up to their work. The amount of overloading which they will sustain without collapse is limited. In these latter years it has become the custom to sing the praises of a carbohydrate diet and to attribute all sorts of ills to the proteins, especially to those of "red" meat. In America, where food fads flourish to an extent even greater than in this country, and where the inhabitants are in the habit of stoking up, especially at breakfast, on farinaceous foods of all sorts, diabetes is rapidly on the increase; its heavy incidence among the rice and sweetmeat-eating Bengalis is well known. My own observations would lead me to believe that it is also on the increase in this country, a fact which may be correlated with the demand, attested by the butchers throughout the land, for smaller joints.

How readily a normal pancreas will collapse it is difficult to say; many diabetics show a history of diabetes in the family; in others the onset may follow on an acute illness; in many cases no predisposing cause is to be found. Such sporadic cases are usually severe, and may be due, as suggested by Cammidge, to the inheritance of the diabetic tendency as a recessive, in which case a family history would be difficult to obtain.

In children, no matter how it occurs, the condition is always dangerous and difficult to treat; in young adults surprisingly good results may be obtained once the load is removed from the pancreas by means of insulin and diet. In all cases except the mildest, such as occur in the elderly, it is advisable to have recourse to insulin early in treatment, but in many cases in youngish persons the islet cells of the pancreas may regain their powers to such an extent that the dose of insulin may later be progressively reduced and sometimes dispensed with altogether.

Only recently diet was our sheet anchor in the treatment of diabetes; it still remains a vastly important factor, but we are coming to rely more and more upon insulin, even in mild cases. Until lately it was my custom to fast patients until they were sugar-free, and then to try to build up a diet on which they would remain free without the use of insulin. If possible I liked to send them out on diet alone. My present procedure is still much the same, but I no longer hesitate to use insulin early if there is the slightest difficulty about building up a suitable diet without it. In the case of patients who do not balk at the thought of insulin, which most do until they have had experience of it, I encourage its use even if their case can be controlled without it, as by its use a greater laxity of diet becomes permissible, with a corresponding increase in the comfort of the patient.

The Administration of Insulin.

Patients should always be taught to administer their own insulin, or, at any rate, to have it administered by someone, be it nurse or relative, constantly about their persons. To this rule there is no exception. Insulin must be given within twenty minutes of the commencement of a meal, and always before the same meals. It is impossible for a practitioner to attend his diabetic patients once or twice daily always in the same relationship to meals, and the custom of administering a dose at any odd time during the

day cannot be too strongly condemned. Once the ice has been broken patients usually administer their own insulin without trouble. For both men and women the abdominal wall makes an admirable site for the before breakfast dose; men usually prefer to give doses during the day into the leg below the knee, while women usually select the thigh. In all these sites it is possible to steady the skin with one hand and to give the injection with the other. Patients should be instructed to keep their syringes in spirit and to wash them out with tap water before and after use. This latter point is of importance, as traces of spirit in the syringe will irritate the skin and may even cause ulceration. An intelligent patient can arrange matters so that the administration of insulin even three times daily makes but little difference to the enjoyment of life; there are many such who lead active lives at business or participate vigorously in sports, both in spite and because of three doses of insulin daily.

In all but the simplest cases the determination of the suitable insulin dosage is a matter of some difficulty, and cannot be made without careful watching of the patient. On the whole it may be said that it is better to give too much than too little; hypoglycaemia is something of a bugbear, and the symptoms should be explained to the patient, who should be warned to carry a few lumps of sugar at all times, and to suck a lump if troubled by feelings of giddiness. I have seen two patients rendered unconscious by hypoglycaemia; one of them received 80 units of insulin on the assumption that the condition was coma, but both made perfect recoveries and suffered no ill effects. Most cases of hypoglycaemia will respond readily to a hypodermic injection of 1 c.cm. of adrenaline followed by sugar by the mouth as consciousness returns. It is seldom, if ever, necessary to give sugar intravenously in such cases. Mild hypoglycaemia symptoms are common in patients on a sufficient insulin dosage, but usually pass off without treatment. In its mildest form hypoglycaemia is shown by flushing of the face, giddiness, and a feeling of light-headedness. As it proceeds there may be inco-ordination and incoherence of speech, and later unconsciousness.

From time to time cases may be met with which prove resistant to insulin. This resistance may be of a high degree, so that even with large doses it may be difficult or even impossible to keep down the blood sugar level. Such a condition developing in an elderly diabetic without apparent cause is usually an indication of the development of some constitutional disorder such as cancer or tuberculosis; it may occur acutely in diabetics suffering from severe infections such as erysipelas, or it may occur from no apparent cause in diabetics who have apparently been doing well for some time. In one such case at necropsy I found such islets as remained in the pancreas engorged to the point of destruction with blood—an apparent apoplexy of the islets. In all such cases the outlook is grave in the extreme. Other milder cases may show a fluctuating response to insulin, so that with the patient on a fixed diet the same dose of insulin may at one time fail to control the blood sugar, and at another may produce hypoglycaemia. Such a condition usually indicates the presence of a focus of active sepsis, and is an indication for a careful examination of such possible sites as the tonsils, teeth, accessory sinuses, appendix, and gall-bladder. Eradication of the focus of sepsis has the happiest results.

DIABETIC COMA.

The menace of coma perpetually hangs over the head of the diabetic patient and of his doctor. Apart, however, from the cases referred to above, which for some reason or other become insulin-resistant, it may be said that the onset of coma is indicative of gross carelessness either on the part of the patient or the doctor. So far as subjective symptoms are concerned it may fall on the patient with as little warning as a thunderbolt, but acetone will have been present in the breath and ketone bodies in the urine for weeks beforehand. Cases have been reported in which there was no acetoneuria, but it is difficult to believe that the coma was diabetic. Coma is unusual in patients who are taking anything like a sufficient insulin dosage, but it may occur when the dose is insufficient, and in these circumstances there is always some doubt as to whether the

unconsciousness is due to diabetes or to insulin hypoglycaemia. The presence of sugar and ketone bodies in the urine is strong evidence in favour of coma. A high blood sugar in conjunction with ketone bodies in the urine makes the diagnosis to all intents and purposes certain. Where means of investigating the blood sugar and urine are not available it is possible to make a fairly certain diagnosis on the history and the clinical appearance. Patients in advanced hypoglycaemia show a moist skin, flushed face, and a bounding pulse; their respiration is deep, but not stertorous. Patients in coma show a dry skin, a pale face, and a weak pulse; in the later stages their respiration is usually stertorous, and the Babinski reflex may be plantar in type. In addition, for those who can smell it, there is the odour of acetone—the odour of sanctity of the hagiologists. The management of coma demands constant care and attention. The enemies to be combated are hyperglycaemia, acetonæmia, and heart failure. Insulin is the first requisite, and should be given at once in a dose of from 80 to 100 units. It is my custom to combine it with sugar by the mouth with a view to combating the acetonæmia. Since there is already excess of sugar in the blood this may seem irrational, but it works well in practice. It was formerly our custom to treat coma with large doses of sodium bicarbonate given by the mouth. In a small series of cases treated with and without the alkali at the Royal Hospital we found, however, that those not given the bicarbonate did best; and in view of this and of certain experimental evidence that excess of alkali interferes with the metabolism of carbohydrate, we have discontinued its use in large doses. In cases in which, as often occurs, the blood is thick and viscous, intravenous injection of saline is indicated. There is some evidence that in coma there is a diminution of the chlorides in the blood, and having this in mind, and with a view to bringing about a dilution of the blood by osmosis from the tissues, we have lately been trying the effect of the injection of a solution containing 2 per cent. sodium chloride and 5 per cent. sodium bicarbonate. It is too early yet to report on this measure.

After the initial dose of insulin further doses must be controlled by the blood sugar; usually a further 40 units or so is required within about two hours, and thereafter not more than 10 units hourly. I have found no benefit in the administration of the immense doses advocated by some authors. Next to giving insulin the most important step is to get the bowels open, and to this end enemata should be continued until a good result has been obtained. The state of the heart will demand attention, and in most cases the hypodermic injection of camphor in oil will be indicated early in the course of the condition. The patient must be kept warm with hot-water bottles, and large amounts of fluid, preferably water, must be administered—if possible by the mouth; but otherwise by the rectum or subcutaneously.

By these means it will be possible in most cases of coma, except in those dependent upon the existence of some acute infection, to reduce the blood sugar to normal and to free the urine from acetone. Even when this result has been brought about, however, the issue may be fatal; cases occur in which unconsciousness persists and death results in spite of a normal blood sugar and a urine free of acetone. The diabetic once in coma cannot be regarded as out of the wood until he has been conscious for several days and showing a normal blood sugar and urine. I have known patients admitted to hospital in coma to relapse twice, the second time fatally.

DIABETES COMPLICATED BY SEPSIS.

The existence of any septic condition, whether it be an acute infection, a carbuncle, or a limb affected by "wet" gangrene, complicates the management of a diabetic case and facilitates the onset of coma. In such cases it is of primary importance to get the urine free of acetone and to keep it so. To this end there must be no restriction of the carbohydrate in the diet; a liberal amount must be taken and balanced by sufficient doses of insulin. It is usually desirable for the patient to take between 80 and 100 grains of carbohydrate daily, the form being immaterial. In very severe infections glucose water or fruit juice may be the most convenient form; Benger's food is usually well

tolerated, and in milder conditions the bulk of the carbohydrate may be taken as bread. The following skeleton diet, which may be modified to suit the particular case, is in use at the Royal Hospital.

Meat, fish, poultry, eggs, clear soup, bovril, broth, cabbage, cauliflower, lettuce, endive, tomato, grape fruit, asparagus, mushrooms, sea-kale, cucumber, chicory, spinach, celery (*as desired*).
Tea, coffee, and unsweetened lemon juice in water (*as desired*).

Compulsory Ration.

Benger's food made with milk half pints during the day.
..... units of insulin are to be taken before each half-pint of *Benger's food*.

Bread: ounces during the day, with meals. Butter as desired.

(If specially ordered) *Jam or preserve*—half an ounce with bread, at a meal.

A further units of insulin is to be taken before of the daily meals, one of which must be the one at which the jam is taken (if ordered).

Total daily insulin dosage units.

Carbohydrate approximately grams.

CARE OF DIABETICS BEFORE AND AFTER OPERATION.

In operations upon diabetic patients it is a matter of the utmost importance to avoid ketosis. For a clean operation, such as an interval appendix or radical cure of a hernia in a well-controlled diabetic, few special precautions are necessary. Where, however, there is sepsis, as in the case of amputation of an extremity for wet gangrene or the excision of a carbuncle, it is well, if possible, to delay the operation until the diabetes has to some extent been controlled. The following procedure, subject of course to modification to suit the individual case, is the routine at the Royal Hospital.

1. Three days prior to operation increase the carbohydrate content of the diet to at least 100 grams.
2. Operate early in day.
3. Three hours before operation give carbohydrate content of usual breakfast *plus* 10 grams of glucose. Give usual morning insulin at same time.
4. Simple enema one and a half hours before operation.
5. Immediately before operation give 10 to 20 units of insulin.
6. On returning to ward give 30 to 40 grams of glucose as 10 per cent. solution in saline, rectally, with 20 to 30 units of insulin.
7. Two hours after operation take blood specimen and give glucose or insulin according to result.

The diet in early days after operation should be liquid and soft, and should largely consist of carbohydrate until the temperature is normal and manifestations of toxæmia have disappeared. The total calories should not exceed maintenance diet during the period of active healing.

In conclusion, I would insist that the successful treatment of diabetes demands the whole-hearted co-operation of the patient. He must have an intelligent appreciation of the condition from which he is suffering, and time spent in explaining this to him is time well spent by his medical attendant.

COLLES'S FRACTURE:

AN EFFICIENT AND ECONOMICAL METHOD OF SPLINTING.

BY

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THE cost of after-care (massage, physiotherapy, and electrotherapy) in the treatment of fractures has been mounting up in recent years to an alarming extent. The time has come for the surgeon who prescribes this treatment—often as a matter of routine—to consider whether this expense is justified, or whether equally good, or even better, results might not be obtained by well-considered splinting.

Efficient splinting should ensure complete immobilization of the fragments after reduction, and, in the case of the Colles's fracture, fixation of the hand in such a position that the patient is able to use it as soon as the damage to the soft tissues begins to subside. Jones's and Carr's splints are the two most commonly used. The former provides the more perfect fixation of the fragments; the latter the better position from which to start re-education. I find that the

best features of both splints can be combined in a carefully applied plaster case.

The treatment of a Colles's fracture may be divided into three stages: (a) reduction of the fracture; (b) splinting; (c) after-care.

A. Reduction of the Fracture.

Reduction of the fracture under an anaesthetic can generally be easily obtained by steady traction on the hand and manipulation of the fragments into position by the thumb and forefinger. If more force is required the well-known manipulation of Sir Robert Jones provides all that is necessary; but as little force should be used as possible. Complete reduction is indicated by the restoration of the radial curve, as described by Sir Robert Jones, and of the correct relationship of the styloid processes.

B. Splinting.

A roll of stockinette is run up the arm, extending from the knuckles to the elbow. Over this a light plaster case is applied. With the thumb and forefinger of one hand the surgeon holds the fragments of the radius in the corrected position, and with the other hand holds the wrist in about 15 degrees of dorsiflexion and slight ulnar deviation while the plaster sets. It is essential that the plaster should be closely moulded to the dorsum of the wrist and that the angle of dorsiflexion should be exactly opposite the joint. To prevent rubbing the skin, the plaster should extend, glove fashion, half-way up the metacarpals, and should allow full palmar flexion of the metacarpo-phalangeal joints. (Figs. 1 and 2.)

FIG. 1.

FIG. 2.

FIG. 3.—Showing strip cut from plaster.

The occurrence of pain and swelling of the fingers may be avoided by cutting out from the back of the plaster, before it sets, and from the underlying stockinette, a strip about half an inch wide, leaving a bridge at the top and the bottom (Fig. 3). A radiogram to confirm the correction should be taken through the plaster.

C. After-care.

As soon as he recovers from the anaesthetic the patient is encouraged to use his fingers and gradually to develop the use of his hand. In a week or ten days he is able to do anything within the limits imposed by a cock-up splint. The plaster case is removed at the end of a month, by which time bony union has generally taken place, and as