Memoranda

MEDICAL, SURGICAL, OBSTETRICAL

RAW MILK AND DENTAL CARIES

A COMPARISON OF THE TEETH AND DIETS OF TWO ISOLATED ISLAND COMMUNITIES

The prominence recently accorded to the dental perfection of the islanders at Tristan da Cunha prompts a comparison in this respect with the members of another isolated community—namely, the islanders at Pitcairn—who, in curious contrast, have notoriously bad teeth.

Concerning the Pitcairn Islanders, Rosalind Young, herself a native of the island, in the *Story of Pitcairn Island* (1894), referred to "the loss of the front teeth, which is quite general." Staff-Surgeon Lobb (Admiralty Report, 1907) said: "The incisors are mostly attacked, those of the upper jaw more than those of the lower . . . . giving to many of even the young women a 'toothless hag' appearance. The other teeth may or may not be decayed or absent. In many examined the remaining teeth were perfectly sound; in others practically all the teeth were decayed or absent." Staff-Surgeon Lindop (Admiralty Report, 1911), after a brief visit, wrote: "I noticed the upper incisor teeth of many of the boat's crew were missing, and found the same thing in several cases of the women on shore. . . . The molars are decayed in some instances, but on the whole compare very favourably with bluejacket teeth."

DIET OF THE ISLANDERS

These two communities (of Pitcairn and Tristan da Cunha) exhibit many points of similarity. Both are descendants mainly of British males and native females, both depend on visiting ships for flour, etc., as cereals are not cultivated by either; fish and eggs form a large proportion of their diet, flesh foods are eaten comparatively sparingly, and deaths are reported as usually occurring from accident or old age. But while Tristan depends largely on potatoes and grows apples, Pitcairn produces the very similar yam and sweet potato and a large variety of fruits, and also produces sugar cane, "syrup made from its juice being used instead of sugar." There would appear, however, to be a sharp difference in the consumption of fresh milk. In Tristan in 1904 there were about 500 head of cattle. According to Mrs. Rose Rogers, who lived there from 1922 to 1925, when children are being weaned the custom is to give them milk warm direct from the cow, as milk is never heated and hardly ever diluted for them; moreover, it remains one of their staple foods throughout their lives. In Pitcairn, on the contrary, there were from 1859 to 1894 no cattle, and so far as I can ascertain there have been none since, as the island is considered too small to allow of their increase. It possesses many goats, but these are mainly referred to as being wild and hunted, and so not available for dairy purposes.

DENTAL CONDITIONS ON PITCAIRN

In the *Story of Pitcairn Island* there is no reference to the use of milk there during the whole if its history. Curiously enough, the Admiralty report (1911) made on my behalf by the courtesy of Sir James Porter, the then Director-General of the Naval Medical Service, and regarding certain dental characteristics at Pitcairn, stated that tinned milk was one of their luxuries. Apparently the only raw milk used at Pitcairn is mother's milk. It is of interest to note that the incisor teeth are among those that might particularly be expected to be detrimentally influenced by the absence of milk from the diet in early life—as they are largely developed and calcified during the first six years—and that even the mandibular incisors are attacked, which is rarely the case in England, as their non-retentive shape is looked on as being specially protective, whatever other errors in development, formation, or diet may be present.

Both Admiralty reports agree that the teeth developed later and erupted when the child is old enough to exercise some choice in its foods are freer from caries than the earlier-developed permanent teeth, which, in view of findings recently expressed with regard to the possible effects of raw milk on dental formation and resistance, is what one would expect in the circumstances.

Again by the courtesy of the naval medical authorities a further inquiry is now being made relative to the details of child nurture, and the absence, in more recent years, of a fresh milk supply at Pitcairn.

Of great interest in this connexion would be a report on the state of the first permanent molars, which one would expect to show a high incidence of caries; indeed, the fact that they "compare very favourably with bluejacket teeth" indicates almost that this is the case.

EVELYN SPRAWSON, M.R.C.S., L.D.S.
London Hospital Dental School.

A CASE OF ACUTE OSTEOMYELITIS OF A DORSAL TRANSVERSE PROCESS

The following case seems worthy of record on account of the rarity of the condition and the difficulty of diagnosis in the early stages.

CASE RECORD

Henry G., a farm labourer, previously in good health apart from slight dyspepsia, presented himself on March 3rd, 1932, complaining of pain in the back, "under the right shoulder." Muscular rheumatism was provisionally diagnosed, and treatment prescribed. Two days later there was fairly severe pain of a continuous nature between the right scapula and the spinous processes. There was some old-standing bronchitis, but no lesion could be found to account for the pain. Sedatives were given. The pain increased in severity, remaining in the same situation, and on March 13th he was seriously ill, groaning with pain, his temperature being 101°, and his pulse rate 120. Respiration was not painful, and there was no pain on percussion or springing of the ribs, nor on percussion or movements of the right scapula. Percussion of the 5th, 6th, 7th, and 8th dorsal spines caused definite pain, but it was not more marked in one than another. There was some oedema between the vertebral border of the right scapula and these spines, and this area was very tender. Aortic aneurysm seemed a possibility because of the intensity of the pain, but examination excluded this. Spinal caries with miliary dissemination of tuberculosis seemed more probable, whilst pyogenic osteomyelitis of a rib or vertebra had to be considered. It was obvious that he had not a mural empyema, though an interlobar one was a possibility, largely discounted by the severe pain. *X* rays failed to furnish convincing evidence of the condition of the bones, but showed lung shadows suggestive of tubercular involvement, increasing the probability of spinal caries as the correct diagnosis. The patient was admitted to the Butterfield Hospital, Bourne, for observation. He was acutely ill, the temperature chart showing an irregular pyrexia up to 102°. Frequent doses of morphine were necessary for him to obtain any rest. It was essential that a correct diagnosis should be made between the two most probable conditions—spinal caries and pyogenic osteomyelitis—the treatment for each of these being absolutely contraindicated for the other. Three days after admission the red and tender area showed signs of fluctuation, and on introducing a wide-bore needle, thick green pus was obtained, which on culture showed a pure growth of *Staphylococcus aureus*.

Progress

On March 30th Dr. Monteith operated under ether anaesthesia, the incision lying vertically alongside the needle puncture. A narrow track of pus was found, leading down to a cavity which was bounded posteriorly by the mass of the erector spinae muscles, and anteriorly by the transverse processes with the intertransverse ligaments, and extended 4 inches vertically. When this had been opened up and cleaned out, bare bone was felt at the tip of the sixth transverse process. This was gouged out, mainly with an antrum burr, and the wound packed with 1 in 1,000 acriflavine. Next day continuous irrigation was instituted with Dakin's solu-

tion, and this was continued for two weeks, a 2 per cent. solution of chloramine-T being substituted for it after a few days. This kept the wound very clean and was much less irritant to the skin. There were occasional rises of temperature during this period, but the general condition was very greatly improved, and after six weeks he left the hospital with a small sinus. This was packed daily, two exposures of ultra-violet light being given to hasten healing, and to-day, nine weeks after the operation, the wound is completely healed, he is free from pain, and in very good health.

I am indebted to Dr. Monteith for permission to publish the details of this case.

JOHN DONOVAN, M.B., Ch.B.Leeds, M.R.C.S., L.R.C.P.

Bourne.

PERITONITIS DUE TO B. FRIEDLANDER

The following case may be of interest.

A girl aged 9 was admitted to the Mildmay Mission Hospital, Bethnal Green, at 7 p.m. on June 25th, 1932; she was unconscious, with temperature 104° F., pulse 160, almost imperceptible, and respirations 44. There was a history of a sudden onset of abdominal pain two days previously, accompanied by diarrhoea and vomiting; this had persisted on and off. On the morning of June 25th the child had become light-headed, later drowsy, and then unconscious. On admission she vomited some bile-stained fluid. There was a past history of frequent bilious attacks.

On examination she appeared desperately ill, with drooping eyelids and an earthy complexion, unconscious of surroundings, lying with knees slightly drawn up, and plucking restlessly at the bedclothes. The skin was warm and dry, the tongue dry and furred; the throat appeared natural, but there was some nasal discharge. Breath sounds were diminished at the right base, otherwise the chest was normal. In the abdomen there was some fullness below the umbilicus; the upper part moved with respiration. There was definite rigidity in the right iliac fossa, and a little in the right upper quadrant and left iliac fossa. Pressure in the right iliac fossa roused the child and caused her to draw her legs up. Percussion yielded a resonant note above the umbilicus and a dull note below it. The vagina was reddened, but there was no discharge. A catheter specimen of urine showed a trace of albumin but no sugar.

The child was placed in full Fowler position, and at 9 p.m., under local anaesthesia, a small incision was made and a tube inserted into the peritoneal cavity. A dark offensive fluid containing flakes of lymph was found. Ten thousand units of anti-gas-gangrene serum were injected intramuscularly, and half a pint of 5 per cent. glucose in saline given intravenously. There was a slight temporary improvement in the pulse, but the child died after a short convulsion at 12.15 a.m.—five hours after admission.

Post-mortem Findings

The tonsils exuded pus on squeezing. The pleura and pericardium were normal. The right lower lobe was a little congested, but otherwise the lungs were healthy. The heart was normal, and the thymus was present. The peritoneal cavity contained a large quantity of dark offensive fluid containing flakes of lymph and a fair amount of greenish pus. The peritoneum was deeply injected throughout, including the peritoneal surface of the intestines and appendix, and especially in the pelvis and lower abdomen, where there were some early adhesions. The uterus and appendages appeared normal, but were not opened; the appendix was normal. The centres of the liver lobules were deeply engorged, and the spleen was soft and septic; the intestines were normal.

A swab was taken from the tonsils and another from the peritoneal fluid; *Bacillus friedlander* was grown from both.

It seems, therefore, that this was a case of primary peritonitis due to Friedlander's bacillus, and that the portal of entry was probably the tonsils.

I am indebted to Mr. R. J. McNeill-Love for permission to publish this case.

A. B. COOK, M.B., B.S.

Bethnal Green.

Reviews

DISEASES OF THE INTESTINES

Professor R. BENSAUDE, of the Hôpital Saint-Antoine, and his collaborators are producing a series of volumes devoted to diseases of the intestines. The first was favourably reviewed in these columns last year, and the second part has recently appeared.[1] Each volume consists of a series of monographs written by Professor Bensaude and one of his colleagues. After a short historical note the pathological anatomy, both macroscopic and microscopical, is considered, the clinical symptoms and *x*-ray appearances reviewed, and the appropriate treatment defined. Each section is furnished with an adequate bibliography. The present volume fulfils the promise of the first, and deals mainly with affections of the large intestine, cancer, tuberculosis, the after-effects of dysentery, abnormalities of size and position of the colon, and diverticulosis.

Diverticulosis of the colon and its complications as a result of inflammation are discussed in an interesting way. The pathology of the condition, which is recognized as an acquired disease, is fully described, with numerous original pictures of the macroscopic and microscopical appearances. The number of theories advanced as to its causation is evidence enough that none of them is completely satisfying. Diverticula are rarely caused by the traction of a tumour or inflammatory adhesions outside the bowel. The more usual cause is an increased intra-intestinal pressure associated with diminished resistance of the intestinal wall as the result of localized inflammation due to stasis, trophic disturbances, or increased size of the vascular orifices secondary to distension of the veins or deposit of perivascular fat. The diverticula protrude through the intestinal muscle wall, and when fully developed are covered only by connective tissue; peri-diverticular inflammation, therefore, easily results in complications which give rise to symptoms. The *x*-ray appearances are well illustrated, particularly the "accordion pattern" of diverticulitis. Medical treatment is advocated, and surgery is reserved for complications; even then resection is said to be rarely possible, and caecostomy or colostomy is recommended. Diverticulosis of the colon is often accompanied by diverticula in the small intestine. A special section is devoted to diverticula of the duodenum, a condition which Bensaude regards as insufficiently recognized by clinicians. They are no longer a radiological or pathological curiosity, but have clinical importance also. The symptoms may be mainly those of dyspepsia, with a feeling of weight or distension in the epigastrium or right flank after meals, or they may simulate a duodenal ulcer. In some cases vomiting may be prominent and lead to suspicion of pyloric obstruction, while in other cases jaundice or interference with pancreatic digestion may occur. Diagnosis is established by *x* rays, and radiologists are now conversant with the characteristic appearances. Treatment is usually medical: bismuth and kaolin have a soothing effect. Surgery is needed to remove the cause of the trouble, but the situation of the diverticula and their close association with many important structures in the upper abdomen make operative procedures difficult.

French authors have long insisted on the differentiation of an elongation of the colon (dolichocolon) as an acquired condition from the congenital type of megacolon known as Hirschsprung's disease. In the former, medical treatment by diet, paraffin, colonic lavage, and electricity is indicated; in Hirschsprung's disease (if dilatation of

[1] *Maladies de l'Intestin*, Série ii. Par R. Bensaude *et al.* Paris: Masson et Cie. 1932. (Pp. 495; 156 figures. 70 fr.)

themselves, in spite of proper supervision, we believe to be explainable in two ways: (*a*) in some of these fractures the line of cleavage is not transverse but oblique from before backwards, whereas in others the line is more transverse; (*b*) in the oblique fractures there is less serration of the bone edges, thus impaction is not so secure after reduction.

As we have performed most of our reductions under the fluorescent screen it is easy to decide if there is this tendency to displacement. As the result of numerous observations and reductions under the *x*-ray screen we have decided that there is no one definite way to put up a Colles fracture, as each one depends on its own individuality. We do, however, point out from our direct screening reductions that in the majority of cases we have to splint the wrist in flexion with slight ulnar deviation in order to keep perfect alignment of the fragments.

4. *Splintage.*—We agree with the author that the plaster splint moulded as he suggests is the method of choice, although we often use a light aluminium flexion splint.

5. *Post-Reduction Treatment.*—Here we disagree with Mr. Platt, and are of the opinion that massage and movements should be commenced as soon as possible.

—We are, etc.,

E. L. BARTLEMAN, M.B., Ch.B.Ed.
G. O. TIPPETT, M.B.Lond., F.R.C.S.

London, W.1, Aug. 22nd.

INJECTIONS OF OXYGEN

SIR,—Dr. Campbell's letter regarding oxygen may be very valuable as a statement of its tension in the tissues, but after working for ten years on the subject one ought to expect that he has come to some decision regarding its therapeutic value. He refers to some success obtained by "American" observers who have introduced oxygen into the system, but studiously avoids all reference to any work of a therapeutic nature done in this country, although his attention has been drawn to it; and when he says that oxygen "also benefits mucous membrane lacking oxygen owing to pathological changes" he uses a phraseology closely resembling that used by the person who took the liberty of drawing his attention to it. In the *Medical Press and Circular* for February 17th, 1932, in a short article on the value of oxygen, I speak of its value in gastritis, gastric ulcer, debility, and anaemia. I also speak of its value as a therapeutical agent in my book *The Heart and Spleen in Health and Disease.* At the meeting of the South Wales Branch of the British Medical Association on April 7th I read a paper on the value of oxygenating milk, a synopsis of which was forwarded to the Editor of the *Journal.* It may interest readers to know that as the result of introducing oxygen into the alimentary canal an increase takes place in the amount of haemoglobin and in the number of erythrocytes.—I am, etc.,

Swansea, Aug. 28th. G. ARBOUR STEPHENS.

SIR CHARLES HASTINGS

SIR,—May I be allowed to supplement the evidence as to the birthplace of Sir Charles Hastings, given in Mr. Hastings's letter in the *Journal* of August 20th (p. 383). My aunt, Miss Hastings; who is living now at Malvern in her 88th year, and who is Sir Charles's only surviving niece, has in possession the family bible, which contains an entry showing that he was born at Ludlow on January 11th, 1794, and was the ninth of a family of fifteen.

Miss Hastings tells an amusing story of how Sir Charles once immersed her in a bucket of water when as an infant she showed signs of delicacy. Her mother was far from satisfied as to the wisdom of this method of treatment, but a long and active life seems to have proved its efficacy.—I am, etc.,

Athenaeum, Aug. 24th. E. A. H. JAY.

SACRO-ILIAC SUBLUXATION

The reviewer wishes to assure Dr. James Fleming of his agreement with the views expressed under the above heading in the *Journal* of August 27th (p. 422). He pleads guilty to indulgence in irony when he wrote of the relief which British surgeons might feel, and irony in criticism is apt to be misunderstood. It was his intention in both the notices in question to support the position taken up by Sir Robert Jones and the late Dr. R. W. Lovett, holding, as he does, that the group of symptoms attributed by some to sacro-iliac subluxation have other causes, and that the existence of that displacement needs further proof. In an attempt to avoid dogmatism it seems that he fell into obscurity.

Obituary

SPENCER HONEYMAN

We greatly regret to announce the death of Mr. Spencer Honeyman at the age of 71. Mr. Honeyman served for forty-one years as Librarian of the British Medical Association, retiring in 1929. At the time of his retirement it was recalled that in 1888 Mr. Ernest Hart asked Mr. Honeyman to assist him in forming a library, and he was appointed Librarian on July 19th, 1893. An interesting point noted at the time was that Mr. Honeyman's retirement closed a connexion between his family and the Association which had existed since 1853, when his grandfather, Mr. T. J. Honeyman, became publisher of the *Journal* and collected the subscriptions of members. His father, Mr. J. N. Honeyman, was in the service of the Association from 1853 till his death in 1903. Mr. Spencer Honeyman had a remarkable record of service, inasmuch as in the whole of his forty-one years he never missed a working day on account of sickness or any other cause. The members of the staff with whom he worked and the numerous members of the Association with whom he came in contact in the Library will, we are sure, wish to express their sympathy with Mrs. Honeyman and the family in the death of one who was, in his unostentatious way, a devoted and faithful servant of the Association.

Universities and Colleges

ROYAL FACULTY OF PHYSICIANS AND SURGEONS OF GLASGOW

At the monthly meeting of the Royal Faculty of Physicians and Surgeons of Glasgow, held on September 5th, the following were admitted Fellows of the Faculty: T. S. Macaulay, G. D. Malhoutra.

SOCIETY OF APOTHECARIES OF LONDON

The following candidates have passed in the subjects indicated:

SURGERY.—E. F. Baines, V. Constad, G. E. Ellison, J. O. Gordon, K. M. Hahn, M. S. Mules, T. D. Norton, C. V. P. Pillai, W. S. Pitt Payne, S. Pugmire, S. H. Tan, E. Teplitzky, J. C. Williams.

MEDICINE.—E. F. Baines, G. S. Grist, M. N. Mandelstam, F. C. Moll, W. S. Pitt Payne, A. E. A. Ridgway, C. A. Saggoo, S. H. Tan.

FORENSIC MEDICINE.—E. F. Baines, J. L. Bates, J. Harris, G. F .C. Harvey, R. P. Huggins, G. McArd, J. W. Meyers, W. Nicholls, A. E. A. Ridgway, B. Shapiro, S. H. Tan.

MIDWIFERY.—E. F. Baines, J. Harris, H. A. Kamel, M. F. Levick, T. E. Mitchell, J. E. Morrish, C. V. P. Pillai, S. Pugmire, A. E. A. Ridgway.

The diploma of the Society has been granted to Messrs. E. F. Baines, F. C. Moll, M. S. Mules, T. D. Norton, C. V. P. Pillai, W. S. Pitt Payne, and B. Shapiro.

Medical News

Mr. Wilfred Trotter has been appointed by the Home Secretary to be a member of the Advisory Committee on the Administration of the Cruelty to Animals Act, 1876, in succession to Sir Arthur Keith, who has resigned.

The Lord Chancellor has been pleased to confer the dignity of justice of the peace for the City of Oxford upon Alderman William Stobie, O.B.E., M.D.Ed., M.R.C.P., and Councillor Mrs. I. D. Harrison-Hall, M.B., Ch.B.

The annual dinner of past and present students of St. Mary's Hospital will be held on Friday, September 30th, at 7.30 p.m., at the Trocadero Restaurant. Sir Joseph Skevington, K.C.V.O., will be in the chair.

The Fellowship of Medicine and Post-Graduate Medical Association has arranged afternoon courses from September 12th to 24th at the Infants Hospital in diseases of infants and at the Royal Eye Hospital in ophthalmology. Other courses during September and October include medicine, surgery, and the specialties at the Westminster Hospital (September 19th to October 1st), Metropolitan Hospital (October 3rd to 15th), and the Miller Hospital (October 17th to 29th); dermatology at St. John's Hospital (October 3rd to 29th); oto-rhino-laryngology at the Central London Throat, Nose and Ear Hospital (October 3rd to 29th); proctology at the Gordon Hospital (October 3rd to 8th); diseases of the chest at the Brompton Hospital (week-end, October 8th and 9th). A series of lectures on renal disease will be given on Tuesday afternoons at the Medical Society of London at 4 o'clock. A week-end course on rheumatism will be given at Bath on October 1st and 2nd. A course of evening lecture-demonstrations on physical medicine will be given at the London Light Clinic, October 3rd to 27th, on Mondays and Wednesdays, and an evening course of demonstrations on rheumatism will be held by the British Red Cross Clinic on Tuesdays and Thursdays, November 8th to 24th. A week-end course in obstetrics will be given at the City of London Maternity Hospital on October 29th and 30th. All courses and lectures are open only to members of the Fellowship of Medicine (address, 1, Wimpole Street, W.1).

The ninth post-graduate course at Nauheim will be held on cardiac neurosis and treatment of heart disease in general from September 16th to 18th. The course is free.

The winter session at King's College Hospital Medical School will commence on October 1st, but, owing to the building operations on the new medical school, it will not be possible this year to hold the usual opening ceremony and inaugural address. In the place of the latter, however, an intensive post-graduate course will be held from 2 to 6 p.m., to which members of the medical school and other practitioners are invited. The annual dinner of past and present students will be held the same evening at 7.30 o'clock at the Connaught Rooms, Dr. Godfrey de Bec Turtle presiding. A series of post-graduate lectures, free to all medical practitioners, will be delivered in the lecture theatre of the medical school on Thursdays at 9 p.m. from October 13th to December 8th inclusive, and from January 12th to March 23rd, 1933. The opening lecture will be given by Dr. Wilfrid Sheldon on nervous habits in children. Subsequent lectures will be announced weekly in our medical diary.

The People's League of Health has been represented at the eighth conference of the International Union against Tuberculosis at The Hague and Amsterdam, on September 6th to 9th, by Dr. Nathan Raw and Miss Olga Nethersole.

The Minister of Health, at the beginning of the Parliamentary recess, arranged to devote three weeks to visits to certain distressed areas in order that he may inform himself by direct personal contact of their situation, of the measures being taken by the local authorities, and of the prospects for the coming winter. Sir Hilton Young's particular object is to examine the special difficulties affecting areas in which unemployment has been severe and prolonged, and for this purpose he has selected Lancashire, Tyneside, and South Wales as the areas to be visited.

At the International Medical Conference of the Anti-war Congress held at Amsterdam from August 27th to 29th, France, Germany, England, Holland, Switzerland, Czechoslovakia, the Far East, and other countries were represented by doctors, delegates, and nurses. General agreement was expressed concerning the terrible consequences of the past war on the lives and health of the working population—especially in the case of women and children. Dr. Bushnell (London) gave statistics regarding the increase of mental diseases and deficiency, undernourishment, and poor physique. Dr. Riese (Austria) described the practical impossibility of protecting a population against gas attacks during war. An "appeal of the doctors against war" was drawn up, and an international medical committee set up with headquarters in Paris and Berlin. The committee proposes to meet in London in 1933.

Messrs. Oliver and Boyd will publish shortly a monograph on *Maternal Behaviour in the Rat*, by B. P. Wiesner and N. M. Sheard. *The Mechanism of Creative Evolution*, by Dr. C. C. Hurst, will be published early in October by the Cambridge University Press.

In the August number of the *Bulletin of Hygiene* a new section has been included on "Conventions, Laws, and Sanitary Regulations: National and International." It is thought that this section will help medical officers to keep themselves informed of important sanitary enactments at home and abroad.

In 1929 there were 15,821 deaths from cancer in Spain, of which 1,649 were in Barcelona and 1,208 in Madrid. The mortality was higher in the north than in the south of the country.

Dr. Jules Bordet, director of the Institut Pasteur of Brussels, was made doctor, *honoris causa*, of Caen University on the occasion of the celebration of the fifth centenary of its foundation by Henry VI of England.

August 16th was the centenary of the birth of the psychologist Professor Wilhelm Wundt, who died in 1920.

Letters, Notes, and Answers

All communications in regard to editorial business should be addressed to **The EDITOR, British Medical Journal, British Medical Association House, Tavistock Square, W.C.1.**

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QUERIES AND ANSWERS

Gastric Mucin

Professor J. Macewen (Glasgow) writes: Apropos your notes on gastric mucin, in the *Epitome* of August 6th (para. 129), can any of your readers inform me where I can obtain a supply of a reasonably pure preparation at a reasonable price? The only preparation I have been able to obtain is too expensive for experimental and general use.