important handicaps of the research workers, their inadequate pay, poor status and lack of facilities. He also advocated a free access of the pharmacologists to the hospital wards for therapeutic problems. Prof. Inayat Khan (Karachi) discussed the role of a pharmacologist in the pharmaceutical industry of Pakistan. In collaboration with Dr. Siraj Ahmed (Peshawar), he communicated the answers to a questionnaire on the subject sent to various persons connected with the industry and the science. The conclusion drawn from this survey was that there was considerable justification for pharmacologists being included on the staff of the pharmaceutical industry of Pakistan.

The remaining papers were concerned with the teaching of pharmacology. Dr. S. A. Wahid Shah (Peshawar) spoke on "The Teaching of Pharmacology in the Laboratory". He emphasized the importance of students conducting their own experimental work as an aid to grasping the subject more intelligently. He quoted a number of such experiments which could supplement the formal lectures. Dr. M. Shamsuzzoha (Chittagong), while discussing the teaching of pharmacology, criticized the place of the subject in the medical curriculum as a result of the report of the Medical Reforms Commission. He considered that it was not possible for a student to grasp the subject without having an understanding of the fundamentals of physiology, and that teaching drug actions without their application would have an adverse effect on known and accepted teaching methods. Prof. S. M. A. Zaidi (Hyderabad) said that the views of those who taught represented only one side of the story and that it was necessary also to consider the reactions of those who are taught. Prof. Zaidi communicated the results based on the answers received from medical students and general medical practitioners in response to a questionnaire prepared by him. The conclusion was that the subject should be taught after a student had gained a basic knowledge of physiology, biochemistry, pathology and microbiology, and that it should be taught in an applied manner throughout the clinical period. Dr. Anis Mahju (Karachi), while giving his views on postgraduate education in pharmacology, was of the opinion that a student must be encouraged to develop the habit of self-education. He described the programme which a student had to follow at the Postgraduate Medical Centre, Karachi. He also emphasized the importance of frequent seminars and group discussions in which a student could freely participate.

Due to the shortage of time, the papers on the *National Pharmacopœia* by Prof. M. Rabbani (Lahore) and on the scope of research in pharmacology by Dr. K. Ahmed (Rajshahi) could not be read. These will appear in the *Proceedings* of the symposium.

The afternoon session was devoted to the scientific papers, including: "Synergistic Action of Serpajmaline and Isochaksine" by Dr. S. Siddiqui and Prof. M. M. Ally; "Pharmacological Investigations of Harmidine" by Prof. A. H. Khan and Dr. M. Cheema; "Some Aspects of the Influence of *p*H on Drug Action" by Dr. M. Shamsuzzoha; "Effect of Nilamide and Certain Arteriosclerotic Agents on Blood Platelets and Blood Coagulation" by Dr. A. Mahju, and "Micro-biological Assay in Drug Standardization" by Dr. M. W. Ali and Dr. R. A. Khan. There were a number of other research papers connected with pharmacology which could not be read due to a shortage of time.

On the following day a general meeting of the Society was presided over by Prof. Nazeeruddin Ahmed. The following decisions were made:

(1) That a uniformity should be aimed at in the curriculum and examinations in the subject of pharmacology, including therapeutics, in all the medical colleges in Pakistan.

(2) That there should be a uniformity in the staff strength in departments of pharmacology throughout Pakistan, and that there should be a parity in the salaries of teachers in the medical colleges of both parts of the country.

(3) That attempts should be made to start courses for the B. Pharmacy degree in all medical colleges in Pakistan, in order to meet the demands of the rapidly expanding pharmaceutical industry.

(4) That a quarterly journal, to be named the *Pakistan Journal of Pharmacology and Therapeutics*, should be started as soon as possible. (It was decided that the chairman of the publication sub-committee should act as chief editor, and should be left to constitute his own sub-committee for the publication of that journal.)

(5) That a sub-committee should be formed to expedite the publication of a text-book on pharmacology suited to the needs of students in Pakistan, consisting of Prof. Mazharul Haq (Karachi), Prof. S. M. A. Zaidi (Hyderabad) and Prof. Inayat Khan (Karachi).

(6) That lectures and discussions, aimed at benefiting the general medical practitioners, should be arranged by the various departments of pharmacology in collaboration with the Pakistan Medical Association.

(7) That the research sub-committee of the Society should compile a list of the problems under investigation in various departments and invite schemes for further research work. The sub-committee should also find ways and means of developing, co-ordinating and financing the various research schemes.

(8) That a sub-committee should formulate the basic principles, for submission to the Government, which should be kept in view at the time of compiling the *National Pharmacopœia* and that this sub-committee should participate in the deliberations of various committees which may be appointed by the Government for the said purpose. The committee would consist of Prof. Mazharul Haq (Karachi), Prof. S. M. A. Zaidi (Hyderabad), Prof. Inayat Khan (Karachi), and Dr. M. Shamsuzzoha (Chittagong).

(9) That the next annual general meeting should be held at Layallpur at the time of the next Science Conference.

(10) That the Medical Council, which is the body controlling medical education in Pakistan, should have representatives of all the subjects in the medical curriculum on its panel and that a pharmacologist should be taken on immediately.

(11) That the word "Experimental" be dropped from the name of the Society and that it be called the Pakistan Society of Pharmacology and Therapeutics.

S. M. A. Zaidi

RECURRENT 'STOMACH ACHE'

THE Glaxo Volume is published occasionally as a contribution to the science and art of medicine. Among the interesting articles in the twenty-seventh issue is one dealing with recurrent 'stomach ache'. Abdominal pain which recurs at intervals seems to affect children everywhere throughout the world. In England the frequency of the complaint has been estimated from a survey of schoolchildren. This showed that, among 1,000 unselected children, more than 1 in 10 had had at least three attacks of abdominal pain and some had had

many more. Apart from 'red herrings' and diagnoses not justifiable by strict criteria, the causes may usefully be divided into three groups. By 'red herrings' is meant anomalies found accidentally or logically insufficient to explain the main symptoms. Controlled series have shown that under this heading should be included such varied conditions as carious teeth, threadworms, redundant colon, calcified lymph nodes, hernia of the linea alba and epileptiform tracings in the electroencephalogram.

The causes are grouped under organic, emotional and others. Apart from pains due to sickle-cell disease and infestation with round-worms, all organic causes together account for only a small proportion of cases, and each individual organic disorder is distinctly rare. Kidney disease (hydronephrosis, renal infection) was found in 2–3 per cent of a large series. Peptic ulcers do occur in children, but only in about 1–2 per cent of the many children with recurrent pain who reach hospital. Among the rare intestinal causes are Meckel's diverticulum, regional ileitis, partial malrotation and neoplasm. Either air-swallowing or pica may be associated with pain. Other unusual causes are pathological constipation, cœliac disease, diabetes mellitus and porphyrinuria.

As nearly all children with recurrent abdominal pain look physically well and thriving, physical examination reveals no abnormalities in them. In these children a search for emotional disturbances is much more likely to be helpful than indiscriminate laboratory and X-ray examinations. To obtain satisfactory evidence of emotional disturbance, the doctor needs to know the intimate details and the atmosphere of the child's day-to-day affairs in the home and at school, and he needs to know about the family. Most children with recurrent abdominal pain have other expressions of emotional disturbance: appetite difficulties which date back to infancy, there may be a history of sleep problems, bed-wetting, tantrums or undue fears. They may complain also of pains in the head or legs (so differing from those with abdominal pain due to organic disease). Many of the patients are highly strung, fussy and anxious. Many are over-conscientious and, as the mother will often come to admit, "worry themselves into an attack". No single item is conclusive, but the combination of several is often striking and convincing. Recurrent abdominal pain caused by emotional disturbances accounts for by far the greatest number of cases.

MINIMUM MASS-THICKNESS AND ITS EFFECT ON THE MEASUREMENT OF DIMENSION OF CARBONACEOUS OBJECTS FROM THEIR NEGATIVE ELECTRON MICROGRAPHS

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THE present-day electron microscope is capable of resolving particles of sizes smaller than 10 Å. From different measurements it is known that the sizes of the individual biomolecules vary from a few tens to a few hundred angstroms, so it is expected that the biomolecules having dimensions of the order of 50 Å can easily be micrographed. But unfortunately, from the practical point of view, the electron microscopists, in spite of their untiring efforts, have failed to attain this limit without subjecting the specimens to shadow casting or electron staining. This failure is due to lack of contrast between the image of the specimen and the background. Generally, it is assumed that the minimum brightness difference detectable by the human eye is 5 per cent[1,2], and hence the image of an object having brightness difference less than this is lost to the background.

Now, contrast in the image of an electron micrograph is influenced by the factors: (*a*) the spherical aberration of the objective lens which depends on the angular aperture of the objective lens; (*b*) voltage sensitivity of the photographic plate used in recording the image; (*c*) electron scattering power of the specimen. Since in normal electron microscopic work, the aperture angle (θ) lies in the range of 10^{-3}–10^{-2} radians, the effect of aberration ($\approx C_s.\theta^3$) is negligible for these lowest values of the aperture angles. If one decides to work at a fixed accelerating beam potential, φ, then obviously the effect of the beam potential on the photographic response need not be considered. Thus the effect of scattering of electrons by the specimen is the main source of the production of contrast in an electron micrograph.

It is well known that for a biological object exposed to electron beam, the intensity of the transmitted electrons I is related to the incident electron intensity I_0 by the relation:

$$I = I_0 \exp\left(-N/A.\rho t.\sigma_t\right) \qquad (1)$$

where N is the Avogadro's number, A is the atomic weight, ρt is the mass-thickness of the object, and σ_t is the total atomic scattering cross-section for scattering outside the objective aperture angle. Here $\sigma_t = (\sigma_e)_t + (\sigma_{in})_t$, where $(\sigma_e)_t$ and $(\sigma_{in})_t$ are the total elastic and inelastic scattering cross-sections respectively. Thus, if 5 per cent difference in electron beam intensity be reckoned as the threshold value for production of minimum differentiation of image contrast, one obtains from the expression:

$$I/I_0 = 0{\cdot}95 = \exp\left[-N/A.\sigma_t.(\rho t)_{min}\right] \qquad (2)$$

Again, it is generally assumed that biological matter is composed mainly of carbon atoms ($A = 12$) and the contrast arises owing to the presence of this atom. Hence from equation (2):

$$(\rho t)_{min} = 1{\cdot}022 \times 10^{-18}.(1/\sigma_t)\mu g/cm^2 \qquad (3)$$

Now, σ_t is a function of φ and θ, so $(\rho t)_{min}$ is liable to depend on φ and θ. For the determination of σ_t the more reliable formulæ[3] for the total atomic elastic and inelastic scattering cross-sections of carbon:

$$(\sigma_e)_t = \frac{\lambda^2}{\pi {a_H}^{*2}}\left[\frac{16}{q^2 + \frac{1}{R_2^2}} + \frac{4}{q^2 + \frac{1}{R_1^2}} + \frac{16}{\frac{1}{R_1^2} - \frac{1}{R_2^2}} \log_e \frac{q^2 + \frac{1}{R_1^2}}{q^2 + \frac{1}{R_2^2}}\right] \qquad (4)$$

and:

$$(\sigma_{in})_t = \frac{2\lambda^2}{\pi {a_H}^{*2}}\left[4\,R_2^2 \log_e\left(1 + \frac{1}{q^2 R_2^2}\right) + 2\,R_1^2 \log_e\left(1 + \frac{1}{q^2 R_1^2}\right) - \frac{2\,R_2^2}{1 + q^2 R_2^2} - \frac{R_1^2}{1 + q^2 R_1^2}\right] \qquad (5)$$

are used, where $\lambda = (12{\cdot}3 \times 10^{-8})/\varphi_r^{1/2}$ cm ($e\varphi_r$ is the energy of the electron beam in electron volts with relativistic correction), ${a_H}^* = a_H(1 + e\varphi/m_0c^2)$ is the relativistic Bohr radius of the hydrogen atom, $q = 2\pi\theta/\lambda$, $R_1^2 = 4{\cdot}478 \times 10^{-19}$ cm^2, and $R_2^2 = 8{\cdot}610 \times 10^{-18}$ cm^2.