

THE MADRAS MEDICAL JOURNAL

A JOURNAL OF MEDICINE IN ALL ITS BRANCHES.

The Official Journal of the Madras Medical Association.

PUBLISHED BI-MONTHLY.

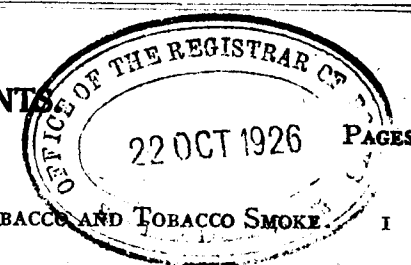
157

Vol. VIII.]

JULY 1926.

[Nos. 5 & 6.]

CONTENTS



1. Original Articles.

PHARMACOLOGICAL ACTIONS OF TOBACCO AND TOBACCO SMOKE. 1
Captain J. C. DAVID, M.B.B.S.

VACCINE THERAPY 17
Dr. K. MADHAVA NAYAK, L.M.S.

2. Gleanings 36

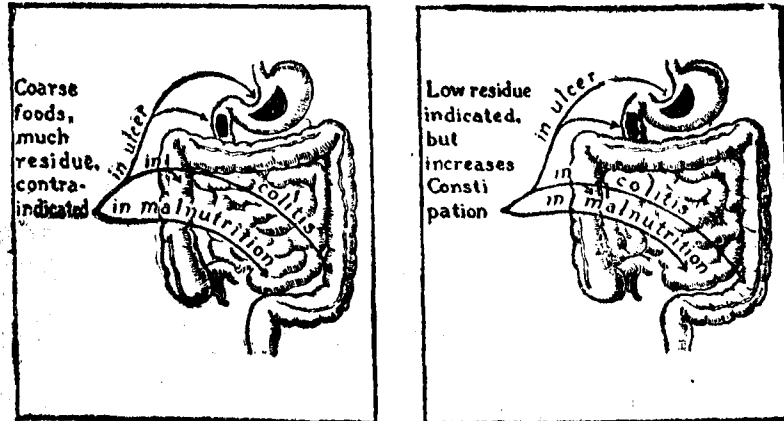
3. Association Notes 49

Published by Messrs. HOE & CO.

for the MADRAS MEDICAL ASSOCIATION.

ANNUAL SUBSCRIPTION.

INDIAN Rs. 5. Post Free. FOREIGN Sh. 7/6 or its eqvt. Post Free.



Dieto-Therapy in Gastro-Intestinal Conditions

A noted gastro-enterologist propounds the following syllogism:

Cases of ulcer, colitis, hyperacidity and malnutrition are usually constipated. Coarse foods are harmful to these patients. But low residue foods increase the tendency to constipation. Ergo—low residue food, plus a high quality intestinal lubricant, solves these nutrition and elimination problems.

The dietetic pendulum has swung too far in the direction of the over-residuized diet in combating constipation, says a leading intestinal specialist. Progressive physicians, he adds, take the dietetic middle ground and instead of

prescribing the over-residuized diet, with or without cathartics, they advise either a low or a moderately residuized diet with an intestinal lubricant.

Nujol, the ideal lubricant, is the *therapeutic common denominator* of all types of constipation. Microscopic examination shows that too high a viscosity fails to permeate hardened scybala; too low a viscosity tends to produce seepage. Exhaustive clinical tests show the viscosity of Nujol to be physiologically correct and in accord with the opinion of leading medical authorities.

Nujol

REGISTERED TRADE MARK

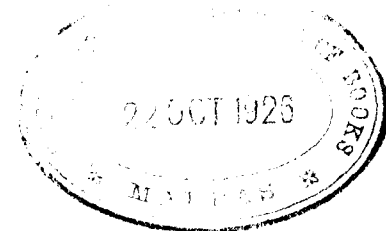
Made by

STANDARD OIL CO. (NEW JERSEY)

Agents: MULLER & PHIPPS (INDIA) Limited

CALCUTTA 21 Old Court House Street

BOMBAY 1436 Green Street



THE MADRAS MEDICAL JOURNAL.

JULY 1926.

ORIGINAL ARTICLES.

A RESUMÉ OF THE PHARMACOLOGICAL ACTIONS OF TOBACCO AND TOBACCO SMOKE.

(CAPTAIN J. C. DAVID, M.B., B.S.)

Except perhaps the prohibition question, there has probably been no other subject on which such a volume of heated argument has been expended than that of the effects of tobacco as smoked, chewed or snuffed. The discussion has mostly been marked with rather unscientific emphasis, some contending that it is entirely harmless when moderately used; whereas, on the other hand, an enthusiastic French writer has gone so far as to attribute the defeat of his nation in the war of 1870, to the prevalence of cigarette smoking. Therefore no apology is needed for opening the subject here and taking stock of the pharmacological effects of this habit on the human system.

The tobacco plant is a native of the New World and belongs to the natural order Solanaceae. The name seems to be derived from the inhaling apparatus of the Caribbees, which was called 'Tobaco.'

The scientific name is 'Nicotiana tabacum.' The generic name Nicotiana has been given to the plant to commemorate the services rendered by Jean Nicot, the French ambassador to Portugal, in spreading a knowledge of the plant. This Nicot in 1559 sent some seed to his sovereign mistress Queen Catherine de Medici and from this the plant came to be called 'Herba Regina.'

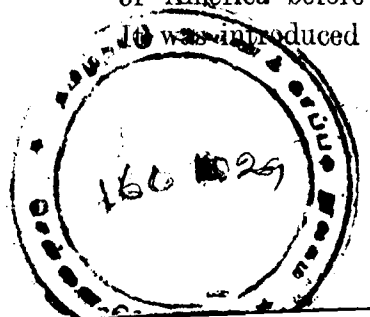
The tobacco plant grows to a height of 2—9 feet, with wide spreading leaves which are ovate, oblong or lanceolate in form. The leaves are attached alternately to the stalk in a spiral so that the ninth leaf overhangs the first and the tenth leaf, the second. The flowers are in large clusters with corollas of rose colour or white tinged with pink and about two inches long, funnel shaped with inflated throats. Leaves and stalks are covered with soft downy hair. It is usually an annual; but in Mexico and certain tropical countries it becomes perennial. The same stalk sends out new sprouts every year. This variety grows wild in certain parts of Mexico and is called *Nicotiana rustica*. This is the variety widely cultivated in India. While it grows wild in Mexico it is never naturalised here and *N. tabacum* on the other hand seems to grow wild threatening in some places, specially in Bengal, even to exterminate the indigenous vegetation. Its origin as an indigenous species cannot be exactly determined, though there is no doubt of its being a native of America. *N. rustica* is cultivated to the greatest extent around Madras and in South India. In *N. rustica* the leaves are distinctly stalked, cordate, ovate, or obtuse, rather leathery and somewhat crumpled. The flowers are in close panicles.

Another species is cultivated in Shiraz, Persia. This has white flowers; and the leaves when cured are yellowish and mild. These leaves are favourites for pipes. The name of this species is *N. persica*. About 50 species have been mentioned cultivated all over the world.

Tobacco had been in use among the aboriginal tribes of America before they became known to 'civilization.' It was introduced into Europe soon after the discovery

of America by Columbus who saw the natives smoking it. Pipes are still being discovered in prehistoric mounds in America. The Chinese claim to have cultivated tobacco and used it long before the discovery of America. But this does not seem to be supported by much authentic evidence. In 1558 Francisco Fernandes, a physician sent to Mexico by Philip II, brought the plant back. Sir John Hawkins carried it to England from Florida and the agents of Sir Walter Raleigh popularised it on their return from their commercial travels to the New World. In June 1619, 20,000 pounds of tobacco were shipped to England. James I made a furious attack on the habit that was becoming fashionable in a paper called "a counter blaste to tobacco" in which he compared the fumes of tobacco to the "fumes of hell." His kingly influence caused a duty of 6d. to a pound to be levied on this article. But in spite of this the habit spread and the cultivation of tobacco was pushed on a large scale in Virginia and neighbouring states. It was brought to India by the Portuguese during the reign of Akbar and it took such a strong hold on the people that Jehangir had to issue an edict to prohibit its use. Sikhs are still prohibited from using this drug by the orders of their Guru—Guru Govind Singh. Now it is cultivated in most parts of the world. The annual production of the world is estimated at 1,000,000 tons.

The tobacco habit is indulged in by various people in various ways. Some prefer smoking a cigar, cigarette or a pipe. The Eastern nations have a way of drawing the smoke through water in a 'Hookah' before inhaling it which perhaps dissolves part of the nicotine. Some others chew it, while a good many use it as snuff. This latter habit was fashionable in Europe during the time



166820

of Francis II of France. Illustrious people like Dr. Johnson used it; and the ponderous and high sounding words with which he is supposed to have asked a friend for this odoriferous article are fairly familiar to all. But this habit is now almost obsolete in Europe while it shows no sign of abating in India. One would certainly not call this habit "aesthetic."

It would be rather appropriate to indicate here broadly what happens to the leaf after it is plucked and before it comes to the market as we see it either as cigarettes or snuff. The leaves are carefully selected and spread in barns specially erected where they are dried and 'cured.' The drying should not be too rapid or else the leaf would crumble to powder. Just the proper amount of heat and humidity are needed to get this 'curing' done properly. The leaves meant for being made into cigars and for chewing are passed through flavouring liquids pressed, dried and sorted out. A certain amount of fermentation takes place sometimes. Molasses are used for chewing tobacco. These flavouring liquids are prepared from secret recipes in the possession of particular manufacturers. Leaves from different parts of the plant go into the composition of one cigar. The innermost leaves are called fillers and are derived from those leaves situated between the root and lower binder leaves and from the bud and the upper binder leaves. The leaves covering this central core are the binders and are found between the middle leaves and the end ones. The outermost layer or wrapper is taken from the middle leaves. The gum in cigar leaf produces much of its value in smoking. Taste, strength, texture, etc., are more or less dependent on the amount of gum present. Brightest

leaves of yellow tobacco are generally selected for pipe tobacco. By a proper admixture of colour and strength of leaf, many brands of pipe smoking tobacco are made from such leaves as bright, dark, brown, etc. These are cured and granulated—not into powder as that would cause irritation to the smoker by getting into the throat when the smoke is drawn through the pipe. The granulated stuff is dampered with spirits or liquids of special formulæ to which certain flavours are added. Cigarettes are made from tobacco specially selected, 3 to 4 years old. The leaves are collected, stemmed and dried and then cut into shreds. Four lbs. of leaf tobacco will go to make 1,000 cigarettes. The wrappers are usually of paper. This paper is called rice paper and burns without odour and almost without ash. It is very thin but tough and almost transparent and is said to be made from fibres of cocoanut palm. Paste is used to cement the wrappers. Some heavy bodied leaves and midribs of pipe tobacco leaves are used for snuff. Usually a number of aromatic substances are incorporated in the powder. It is sometimes mentholated so as to enhance its effect.

The action of tobacco is due to its constituents of which the alkaloid nicotine is the chief. This exists as salts of organic acids and is a colourless liquid which decomposes on keeping and assumes a brownish colour with characteristic odour. To this the narcotic and intoxicating qualities are mainly due. It is present in the plant from the time it commences to grow in seed bed until it reaches maturity and even after it goes through all fermentative changes incidental to curing, sweating and manufacture. The alkaloid is found mostly in the leaves. A substance called nicotiamine is also said to be

present to which has been attributed the flavour and characteristic odour. (Killebrand and Myrick.) The percentage of nicotine is greater just as the leaf reaches maturity than in either green or over ripe leaves. The effect of nicotine after plant growth ceases is not understood and its office in the economy of the plant is not definitely stated. The nicotine content varies in plants from less than 1% to 8% of chemically dry substance. Havana tobacco contains 1.5--3%; Virginian 6--8%, South American 2--6%, Indian 2%--5% and German 1.5--3%. Climate, soil, fertiliser's treatment of crops, etc., all have their influence on the alkaloid content. A volatile oil is developed during the processes of curing, etc. The other substances in the leaf are starch, sugar, cellulose, fatty or resinous substance, albuminoids, acids, mineral ingredients like Potash, lime, magnesia, etc., and chlorides. All these influence burning and flavour.

By the heat of smoking a part of the nicotine is burnt while some passes into the smoke. The drier the tobacco and greater the heat, the less nicotine will escape destruction. Moist tobacco, especially cigars, produce severer effects. Between 15 and 90% of nicotine can be recovered from the smoke. Baumberger, experimenting with cigarettes, found that the amount of nicotine in puffed smoke was about 0.00456 gram and that four cigarettes were equal to one cigar of a mild variety. He also calculated that one puff of a cigarette yielded 0.00137 gram of nicotine. Though there is more nicotine in a cigar less is absorbed because of the manner of smoking it. The so-called nicotine free cigars yield as much nicotine as ordinary tobacco! Chewing tobacco contains about 1.14% of nicotine. The other toxic constituents are

products of combustion, so that the smoke absorbed in puffing and inhaling is a very complex mixture of substances and has been shown to contain CO, HCN, NH_3 , nicotine, pyridine bases and their derivatives, resinous compounds, etc.

The tobacco habit is largely indulged in for its psychic effects but these are not properly understood. Nobody knows to what exactly the enjoyment is due and it is not even proved that nicotine is essential to the pleasurable results. This habit cannot be compared with the use of such drugs as morphine cocaine or alcohol, for it is not taken with the purpose of stimulating or depressing the central nervous system. It is doubtful if the amounts usually absorbed can give rise to such results. Nicotine itself does not give rise to psychic effects. The pleasure might partly be explained in the rhythmic movement necessary in smoking. A certain amount of rhythmic movement demanding no exertion seems in itself to have a soothing, pleasure-giving effect. This is apparent in the enjoyment which seems to be derived by people chewing tasteless innocuous objects such as gums or straws. As nicotine in itself does not seem to be absolutely necessary for pleasure production it may help indirectly by setting up a reflex stimulation from the mouth, nose, etc., along with a slightly direct action on the central nervous system at once stimulating and soothing. The aroma of the cigar seems to be a more important factor than the nicotine content. Smoking in the dark does not give as much pleasure though the nicotine content is the same. Whatever the determining factor may be the pleasure seems to bring along with it a certain repose which, while it

neither directly aids nor hinders the psychic processes, leaves the mind free and in general raises the user's enjoyment of other pleasures, or lessens his annoyance at the opposite. Mendenhall experimenting on smokers and novices found that the immediate effect of smoking upon the sensory mechanism is conditional upon the state of the sensory mechanism at the time when the subject indulges in smoking. If the sensory mechanism is in a state of hyper-irritability the immediate effect is depression or a raising of the threshold of sensory mechanism. It is a matter of common knowledge that smokers deprived of smoke show hyper-irritability which disappears on their resuming smoking. Such people take to smoking to calm their nerves. When the central nervous system is in a state of hyper-irritability all in-coming stimuli are registered more strongly. This is manifested by both physical and mental reactions, physically restless, mentally lowering of efficiency due to confusion from strong registration of numerous in-coming impulses. Smoke by depressing the sensory mechanism shuts out the numerous impulses. This attempts to explain the soothing effects of tobacco on a highly strung individual. When sensory mechanism is in a state of depressed irritability smoking stimulates it and mental ennui is consequently relieved. The pleasure and comfort derived from the after dinner cigar may be attributed to the stimulus which it gives to the central nervous system thus relieving the effects of the rush of blood to the splanchnic area and consequent, though partial, depletion of blood from the higher centres. Non-nicotine smoking does not produce the same results, thus showing that nicotine is the main factor in this mechanism.

Among the devotees of the weed may be found great scholars, philosophers and statesmen. This fact may be brought forward as evidence to prove that tobacco enhances rather than depresses mental activity. But may it not be suggested too that possibly they might have risen to greater eminence without the help of "my lady Nicotine"! No doubt, some great thinkers cannot solve problems of moment unless they light the weed. But this may be just force of habit. Anyway there seems to be enough evidence to prove that inveterate smoking causes slowness and want of energy of psychic functions. J. R. Earp experimenting on students at Ohio, U.S.A., among whom 172 were non-smokers and 132 smokers, came to the conclusion that though in the physical tests usually applied in medical examination the non-smokers did not show any superiority in physique, they proved themselves the better athletes in practice and showed a significant advance in their record of scholarship. This, he thinks, might be due to unfavourable reaction on mental processes by tobacco or else it indicated that the type of mind to which smoking appealed was one less given to mental application. This fact seems to receive greater recognition now-a-days than formerly, as in America quite a number of firms and big business concerns refuse to employ any but those that abstain from the tobacco habit, and of course alcohol.

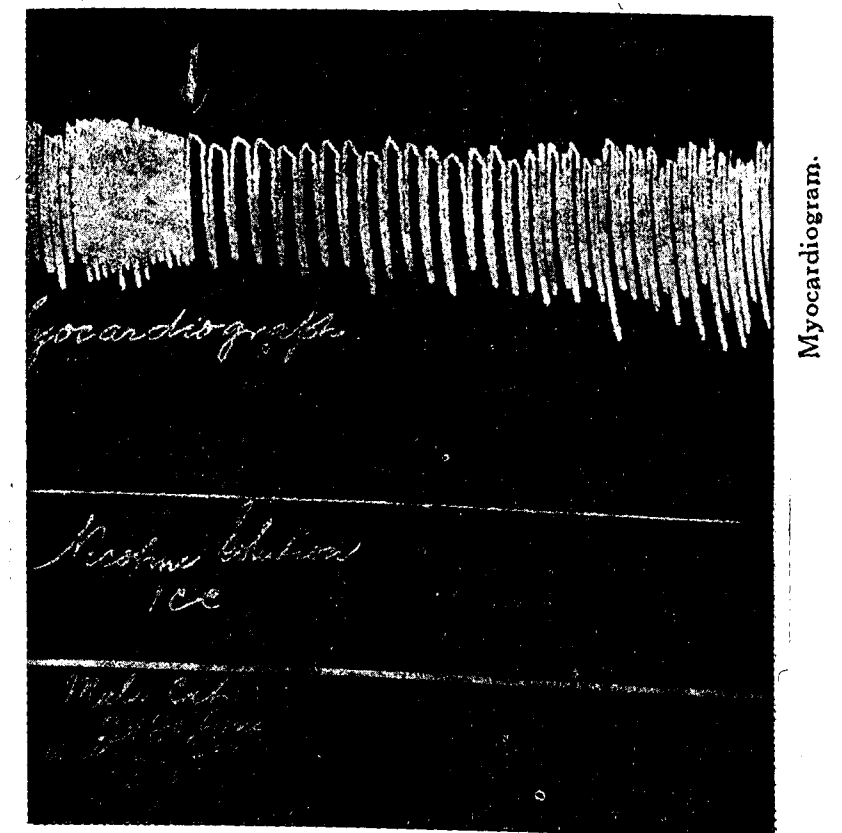
Other nervous phenomena are a disturbance of motor reactions in the direction of lowering the efficiency especially of finely co-ordinated movements, general muscular debility and tremors. These are not seen with moderate smoking and occur only when the habit is pushed to a dangerous extent. Reflexes are heightened.

10 THE MADRAS MEDICAL JOURNAL

Headaches are more common and are probably due to increased intracranial blood pressure resulting from combined effect of nicotine and decreased oxygen supply both of which would tend to raise the blood pressure.

The usual effects of nicotine on the heart is first a stimulation of the vagal centre and ganglia causing a slowing of the heart along with rarely a slight fall of blood pressure which latter is counterbalanced however by the stimulation of the medullary centres and resulting vasoconstriction causing a rise to occur. Later the ganglia are paralysed causing great quickening of the heart. In the novice there is an initial rise of blood pressure followed by a fall. The blood pressure may be raised by nicotine even in the absence of the vaso-motor centre but not if the suprarenals are excised. A part of the rise seems therefore to be due to increased output of adrenalin. The first warning symptoms in smokers of circulatory disturbances are occasional palpitation, quickened heart rate and arrhythmia. These tend to disappear on withdrawal of the drug. The arrhythmia points to increased irritability of cardiac structures.

Digestive disturbances start with loss of appetite and dyspepsia. Nicotine decreases the action of pepsin and rennet. Tobacco may play an etiological roll in neurosis of stomach, in gastritis and even in ulcer and cancer. In moderate doses tobacco seems to help peristalsis and it is a common sight to see one light his cigar preparatory to retiring to the closet! If this effect be due to nicotine the dosage ought to be great and this dosage would be attended by other disturbances. Possibly besides initiating a reflex, the cigar helps one to sit quietly and without hurry; and thus indirectly edu-



A solution was made of the tobacco content of a cigarette in 6 c.c. of distilled water. I. C. C. was injected intravenously at arrow mark.

The right ventricular contractions are being recorded. Central and ganglionic stimulation of vagus caused the heart muscle to beat very slowly. Later paralysis of the vagal ganglion led to extreme rapidity of the heart.

cates and regulates the bowels leading to the formation of regular habits and removal of constipation. Smoking inhibits the hunger contractions of the stomach and the effect has been found useful in staying empty stomachs during long marches and even in the trenches. The Potassium sulphocyanate found in excess in the saliva of smokers has an inhibitory effect on Protein digestion. In chronic smokers peristalsis is first increased and later decreased.

Amblyopia and nicotine blindness rarely occur. The sight gradually becomes dim and atrophy of the optic nerve results in complete blindness.

The capacity for doing muscular work seems to be first increased but fatigue sets in sooner and the total efficiency is decreased. We have already seen its effect on athletes. No coach in the world will permit his charges to use tobacco while they are training for any athletic competition.

Other effects that have been attributed to nicotine but without sufficient cause are impotence, epilepsy and insanity.

Of its local irritant effects, epithelioma of the lips and leukoplakia buccalis may be mentioned. There is also a more general irritation of the mucous membrane of the mouth, throat and pharynx leading to catarrh and hoarseness. A chronic running of the nose is commonly seen in snuffers. More or less generalised dermatitis has sometimes resulted from the use of tobacco as dressings for wounds. Unconsciousness and coma have also developed under similar circumstances. Nicotine has been pilloried as the chief accused and therefore it would do well to consider how much of it is

absorbed into the system and whether this amount would be sufficient to show either acute or chronic symptoms of poisoning. Some smokers just puff the smoke while others inhale it and it stands to reason that more nicotine is absorbed in the latter method. Baumberger from his elaborate experiments calculated that nicotine occurs in puffed smoke to an extent of 0.57% of weight of tobacco smoked. Eighty per cent. of the tobacco is smoked and so the amount of nicotine in puffed smoke would be 0.057×0.8 or 0.00456 gram. He also worked out that the amount of nicotine yielded by one puff is 0.00137. The rate of pulling a cigar or cigarette would therefore determine the nicotine dosage rate for the smoker. Assuming an absorption of 67% from puffed smoke and 82% from inhaled smoke and a rate of inhalation of 5 per minute the dosage rate of nicotine from a cigarette smoke would be 27.5 mgms. per hour in the former and 36 mgms. per hour in the latter case. This amount of nicotine is far in excess of the amount Lehman found could be drunk by habitual smokers in an equal period of time, therefore it seems that the amount of nicotine actually absorbed by the body may be less than calculated from these figures. Solutions of the smoke in saliva and secretions of mucous membrane must undoubtedly occur to a very large extent. This would also be aided by excessive secretion of saliva under the influence of nicotine. The habit of expectorating would rid the body of a large part of retained nicotine before total absorption could take place through mucous linings. However many smokers do not expectorate while smoking. Some absorption does take place as nicotine has been detected in urine, saliva and perspiration. Dixon and Lee found some

evidence of increased destruction of nicotine in liver. The extent to which nicotine poisoning might enter as an effect of habitual smoking would therefore depend largely upon the degree of tolerance the subject could develop, the excess to which the habit is carried and the degree to which inhalation and expectoration are practised.

The quantitative effects of nicotine vary considerably in different persons. Young individuals are more susceptible than adults. A youth surreptitiously embarking on the habit finds himself completely floored by the giddiness, nausea and vomiting then set in. The author has not had the courage to repeat the experiment after a similar experience in his boyhood! The amount of Nicotine in the smoke in half an hour as already indicated would be too heavy a dose for the novice if absorbed and this would account for the severe illness resulting from his venture.

Considerable tolerance is acquired by continued use so that moderate doses lose all the usual unpleasant acute effects. Completeness of the habituation also varies with individuals, dependent partly on individual susceptibility, partly on the manner in which the drug is used, whether the smoke is inhaled or puffed, the saliva expectorated, etc. Tolerance is never absolute. When the tolerance has been established, the continued use of tobacco within a certain limit produces no unpleasant symptoms; but if the limit be at any time sufficiently exceeded, the symptoms of chronic poisoning arise. After a long time some twenty years or so, these symptoms may also, though rarely, occur in those who have always been 'moderate.'

Nicotine is one of the most fatal and rapid of poisons; the vapour arising from a glass rod moistened with it and brought near the beak of a small bird causes it to drop dead at once and 2 drops placed on the gums of a dog may induce a similar result. It acts with a swiftness equalled only by Hydrocyanic acid. In view of the high nicotine content of tobacco (one cigar contains enough to prove fatal to two persons if administered intravenously) and its popular distribution, it is really astonishing that fatal nicotine poisoning is not more common, but just this wide distribution and knowledge of the drug form the safeguard, as also the marked taste.

Besides nicotine, one of the chief products of combustion in tobacco smoke is carbon monoxide. When smoke is puffed into the mouth and then blown out, the smoke contains CO from 0.072 to 0.25% by volume of air blown out. The question of greatest interest is the possible hygienic significance of the retention of CO on inhalation. This retention is undoubtedly due to combination of CO with hæmoglobin of the blood in the lungs. The effect of CO on the human being is not a toxic one but is merely a displacement of O₂ from the blood which leads to asphyxiation in extreme cases. The carbon monoxide is inhaled only at intervals and many breaths of fresh air are taken in between. At each breath of fresh air the CO tension in the lungs becomes very low and the O₂ tension high resulting in displacement of CO from carboxy hæmoglobin by O₂ to form oxy-hæmoglobin (Baumberger). It has been found that 12% saturation of blood with CO can be withstood for hours without disagreeable symptoms and it is extremely unlikely that a degree of saturation of hæmoglobin greater than 12%

ever is the result of smoking; and so this factor is not permanently injurious.

The Hydrocyanic acid of the smoke of a cigar amounts only to 0.002—0.5 mgm. and would have no significance.

The aromatic essential oils, which give the flavour to tobacco are practically inactive.

Arsenic is sometimes present in harmful quantities when insecticides of this drug had been used on the plant. The pyridine bases act similarly to nicotine.

It will be seen that the catalogue of injurious actions to be charged against the abuse of this drug is sufficiently large, but on the other hand, they seem to be absent with moderate use. They disappear if the habit is given up. Limitation in quantity, sufficient expectoration and the avoidance of deep inhalation of the smoke may be sufficient. Total abstinence is of course the best method. The use of tobacco must be avoided in certain pathological conditions where it is contraindicated, in heart disease, dyspepsia, inflammation of the respiratory tract, etc. While undergoing treatment for certain diseases like syphilis, gonorrhœa, etc., smoking is taboo. Smoking has been recommended by some physicians, who ought to know better, on the slightest pretext to their patients, leading to enslaving of these people by this noxious habit. We, as responsible members of the Noble Profession, ought to think twice before recommending a habit to people, the baneful effects of which are greater than the possible benefits derived therefrom.

SUMMARY.

(1) Nicotine in tobacco is chiefly responsible for its effects on the human system.

(2) In moderate doses no apparent injurious effects result. But beyond a certain individual limit certain toxic symptoms occur manifested by a lower standard of mental efficiency, a disturbance of motor reactions in the direction of lowering efficiency especially of finely co-ordinated movements, slight blood pressure changes accompanied by vaso-constriction, cardiac arrhythmia, digestive and visual disturbances, etc.

(3) The amount of nicotine available in tobacco smoke in half an hour is greater than the amount that can be safely taken in solution during the same time without giving rise to poisoning.

(4) The extent to which nicotine poisoning might enter as an effect of habitual smoking would therefore depend largely upon the degree of tolerance the subject could develop, the excess to which the habit is carried and the degree to which inhalation and expectoration are practised.

(5) The CO in tobacco smoke does not cause such saturation of the haemoglobin of the blood as to give rise to dangerous symptoms, as it is diluted with fresh air in between the puffs.

(6) The action of HCN and other products of combustion of tobacco on the human system is negligible.

(7) The baneful effects of this habit are greater than the possible benefits accruing from it, which are more psychical than real.

BIBLIOGRAPHY.

- (1) Baumberger, P.—*Journal of Pharmacology and Experimental Therapeutics*. Vol. 21, p. 23, 42, 55.

- (2) Earp, J. R.—*Lancet*, January 24th, 1925.
 (3) Killebrand and Myrick 1916—Tobacco leaf.
 (4) Lehmann, K. B.—*Munch-med-woch*, LV, 723, 1908.
 (5) Lee and Dixon—*Quart. Journal Physiol.* 1912, p. 372.
 (6) Mendenhall, W. L.—*Am. Journal Physiol.* Vol. 72, p. 549.
 (7) Sollmann—*A manual of pharmacology*, 1924.
 (8) Watts—*Dictionary of economic products of India*, 1891.

VACCINE THERAPY.

* ITS PRINCIPLES, USES, ABUSES, LIMITATIONS AND CAUSES OF FAILURE.

(DR. K. MADHAVA NAYAK, L.M.S., Vellore.)

The subject of my lecture for this evening is, as was announced at the end of the last meeting of this association, Vaccine Therapy—its principles, uses, abuses, limitations and causes of failure. I crave your indulgence for some time and beg to be excused if I wander away from the subject proper at the beginning alone, rather than make you feel bored in the end. These are the days of "preventive medicine" and we live in their midst. Following the discovery of Bacteria in the last century much brilliant work has been done in developing knowledge of them. Unfortunately bacteria have been studied too exclusively in the laboratory cultivated on artificial media. Bacteriologists have therefore lost sight of the human element, and have forgotten that, what is really wanted,

* A Lecture delivered before the North Arcot District Medical Association.

is a knowledge of the bacterium and the human element living together in a state of armed neutrality. A school of bacteriologists has grown up living apart from the wards who might perhaps be termed the "Sterile school". Their observations lead them into a blind alley when they forget the human being in their intense study of the bacterium. They develop the 'test-tube mind.' Practitioners are not engaged in fighting bacteria in the test-tube; their problem is how to control bacteria, living in the human body. The bacteriologist's ideal has been to attempt to remove all bacteria from the world. In other words to sterilize the world. It is time to turn to realities. We cannot, nor shall we ever be able to sterilize the world. Human life would come to an end, if we did. In hundreds of ways bacteria are necessary for human life. We have got to learn to live with our friends the bacteria. Bacteria only cause disease when we break the rules. Let us then learn to keep the rules and make friends of our bacteria and cease from such hopeless struggles as for instance the efforts of ARBUTHNOT LANE who would, if he could, remove the whole intestine preferring to see us die of starvation, rather than we should suffer from intestinal toxæmia. It is quite conceivable that certain products of bacterial decomposition in the intestine can produce toxæmia, and toxic lesions in the tissues. I do not wish to deny this. Parasitic bacteria need not necessarily be pathogenic. What I wish to emphasise is that a far more important rôle is played by the bacteria of the intestines themselves. These bacteria themselves are absorbed into the blood from the bowel. These 'bacterial showers' thrown in the blood stream may result in the most unexpected symptoms. We suffer from intestinal

bacteraemia not from intestinal toxæmia, and most of us suffer from this almost daily, and not merely a few so-called toxic individuals. The question is only a matter of degree. If preventive medicine, in the future, listening to the voice of the bacteriologists, is to set out on a crusade to sterilize the world, it is better to realize from the very outset, that it will be setting out on a hopeless quest. Better far from that, from the very earliest, preventive medicine should teach us as to how to live with our parasites and only endeavour to get rid of those which it is clear we should be better without, such as the tubercle bacillus, the gonococcus and the spirochæta pallida. To attempt to abolish the ordinary germs that live on our skins and mucous membranes is at once, hopeless, and unnecessary. Experimental evidence on animals shows that if bacteria are injected into the blood, they are got rid of by at least four channels. They are thrown out (1) into the connective tissues of the body, and there they are slowly killed without setting inflammation; (2) into the dust bins of the body, such as the joints, bones, fasciæ, lymphatic glands and spleen; (3) through the kidney acting as a filter into the urine; (4) through the cleansing fires of the liver, acting as a furnace into the bile and bowel. The body then must almost daily be taking up organisms into itself as into a sponge—a bacterial sponge. But only in exceptional circumstances, does local inflammation arise in any organ and then only, because that organ or the body as a whole has been submitted to excessive physical strain. Original observations show that bacteria of many kinds are capable of entering the blood stream from the bowel and of producing varied lesions in different parts of the body. In some cases toxins and

protein poisons may also enter the tissues from the bowel, and pre-dispose the tissues to bacterial invasion.

Bacteria of different species may enter the tissues and produce non-specific types of tissue lesions. Bacterial invasion of the tissues is an almost every-day occurrence. The tissues are not sterile for many hours together. Bacteria are intermittently passing through the tissues, as birds of passage. No sooner have the tissues rid themselves of one lot than another lot follows on. The body is not the sterile entity as supposed by Sir Almroth Wright and his school. Wright's conception of the body is as a sterile mass of tissues enclosed in a membrane (skin and mucus membrane) impermeable to bacteria except on the rarest occasions. He pictures a bacterial break through as a rare occurrence and of necessity bound to produce inflammation of the tissues, and he offers to rid the body by vaccines not only of bacteria in the tissues but on the surface of the mucus membrane. Such a conception or postulate is far remote from the truth, and can only lead to false conclusions and disrepute to vaccinists. The body is a bacterial sponge. It is surrounded with bacteria. Some live on other animals, some live in the air; others live always on the skin and mucus membranes of the body. The latter are symbiotic bacteria such as the colon bacillus, staphylococcus and streptococcus. They are useful to us in many ways. We know that they help us to digest cellulose and it is quite certain they have other uses. There is also little doubt that they keep us constantly auto-inoculated and on the average immune. This is true 'Vaccine Therapy.' The symbiotic bacteria are constantly invading the blood stream probably almost every day, usually through the intact skin and mucus

membrane, sometimes through definite ulcers. They soak into the body sponge through the lymphatics, and enter the blood stream. The blood is intolerant of their presence and soon passes them out again; certainly through the body filters the kidneys and the liver and probably through the lungs; certainly into the connective tissues such as the lumbar fascia and muscles (Lambago, stiff neck). Certainly into the 'dust bins' of the body, such as the joints, bones and serous cavities (aching joints in cold weather, growing pains, stitches, pleurodynia).

When we are living a healthy life and are not lowering our general tissue resistance by overwork and chill, we are able to deal with these doses of bacteria and we make use of them to keep up by auto-inoculation a condition of relative immunity. If we constantly disobey the rules of nature, our tissue resistance is lowered, and we get acute and chronic infections of joints, bones, fascæ, muscles, serous cavities, gall bladder, appendix, tonsils, lymphatic glands, kidneys, prostate, testicles, and other organs. We say we are suffering from chill, rheumatism, Lambago, gout, stitch, head-ache, toximea, common cold but really we are suffering from intermittent bacterial invasion of the body sponge. We have got to learn to live with our bacteria and decide what bacteria are symptomatic and commensals and therefore impossible of removal, and to fight out only those bacteria which are parasitic and at the same time pathogenic.

Having accepted this conception of the body as a bacterial sponge we give the right lead to the future of 'preventive medicine.' Preventive medicine headed by the Americans, has gone off in a vain attempt to sterilize our surroundings, to sterilize everything in common use, to run

away from germs and with Lane to sterilize the bowel. We cannot run away from bacteria, to rid the world of bacteria is a hopeless task ; it is better to realize this before going further. Those organisms which are always pathogenic, such as, the gonococcus, the tubercle bacillus and the spirochaeta pallida, we are quite right to pursue until we have exterminated them, if we can. We can make rules to prevent persons passing on these germs, to others to prevent healthy persons taking these up, and to deal with carriers, but is no good trying to rid the bowel of the colon bacillus, either by removing it, as Lane would like, if he could, or by vaccinating us as Wright proposes to do. Fortunately nature has secured, that, not even Sir Almooth Wright shall rid our bowel of the colon bacillus by means of vaccination. Presumably, if he could do so, we should gradually blow up with cellulose until we burst. In dealing with these bacteria, preventive medicine, must correct predisposing causes, and in this way break the vicious circle. We must teach the people how to keep their skins clean, the mouth and air passages clean, and to keep their bowels in order by proper food, efficient mastication and regular bowel action. We must teach people to avoid exhausting themselves with the rush and worry of modern life. We must teach them to use fresh air without contracting chill and teach them, specially women to dress properly. Only by these means we can prevent innumerable infections, and not by sterilizing the throat bowel, air and food. In other words we must teach people how to adopt themselves to their surroundings as it is impossible to prevent their bodies from constantly becoming invaded by common bacteria. The real problem which we have to study is the innumerable accidental

infections of the human system with bacteria. Observations made by exact clinical methods are far more likely to yield results of practical value, not only in regard to treatment, but with regard to the problems of pathology and causation.

PRINCIPLES.

Ladies and Gentlemen, having told so much, I take it for granted that you have always accepted the principles of Vaccine Therapy, and I firmly believe that they will enable us sooner or later to conquer many, if not all, bacterial infections. The fundamental principle of Vaccine Therapy, is the establishment of artificial active immunity, and it is only within recent years the principle of active immunity has been directly applied in the treatment of already existing diseases. This is largely due to the work of Wright, who from his study of the part played by Phagocytosis in the successful combat of bacteria by the tissues was led to advocate the treatment of bacterial infections by carrying on an active immunization against the casual agents by the injection of the dead culture of the latter. The justification for such a procedure lies in his contention that in many cases infections are to be looked upon as practically localised, *e.g.*, the cases of an acne pustule or a boil. The view is that while the local capacities of resistance may have been lowered, resisting mechanisms in other parts of the body have not been brought into play. The vaccine—or in other words the specific bacterial protein may thus stimulate these and the focus of bacterial growth may be flooded with anti-bacterial bodies. Recently it has been proved that this action is no doubt specific for specific bacteria—but that the bacterial proteins do possess a non-specific action in the production

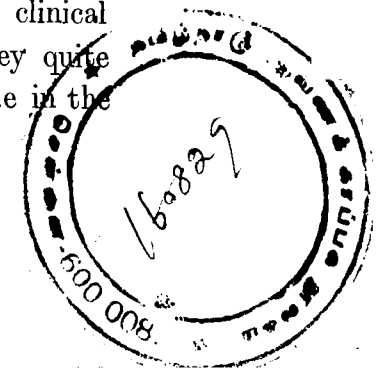
of anti-bacterial bodies. The bactericidal element is mainly extruded from the leucocytes and it is through this that the bactericidal action of the leucocytes is exerted. The anti-bacterial substances elaborated in response to inoculation, operated specifically upon the variety of microbe which has furnished the Vaccine—but in addition some collateral immunisation is also achieved.

Every wise and experienced Doctor knows, only too well, that his efforts simply guide and control nature ; or in other words, that the real cure of a bacterial infection can only be brought about by so adjusting the balance that it swings in favour of the invaded tissues and against the invading bacteria. But even then we constantly find people, on the one hand, who believe that it is not organisms which create diseases, but the soils ; on the other hand, there are those who put their faith in battling against organisms alone, to their extermination. But when researchers find disease organisms in people who are not suffering from the disease which they are expected to cause, what is the arbitrator to conclude ? The fact is, that the exact part played by organisms found in association with signs and symptoms which characterise specific diseases is not accurately enough known in the present state of scientific knowledge. What is perfectly clear, however, is this : diseases will not occur if the soil upon which they prefer to thrive is not there and that after all the fluids and cells of the body are nature's best antiseptics. It is also equally clear from extensive experiments made that immunity is conferred by certain diseases, so far as to render recurrence extremely improbable ; moreover that a mild form of a disease may make it more difficult for a severe form to attack an individual. Hence

Vaccination. But also hence mistakes regarding Vaccination.

I have no hesitation in issuing the warning that there is far more experimentation going on, by way of injecting culture derivatives of organisms than what our already really accurate knowledge of the whole subject warrants. There is rather a tendency to-day towards pumping in all sorts of haphazardly selected material in the hope that some favourable turn of the disease may be manifested in order to give encouragement to victim and victor alike. Again there is a looseness of judgment likely to arise from such promiscuousness, as is commonly observed, in the minds of enthusiasts. That way quite good principles run the risk of becoming temporarily damned. It is most unfortunate that from the earliest days of Tuberculin treatment postulates elaborated by laboratory workers has obtained such a firm hold that you must go on increasing the dose to obtain increasing immunity. This is just what does not happen in the case of human beings and has been the cause of all the trouble. If one advocates this erratic principle of the vaccinist of the orthodox school and starts tuberculin treatment in doses much too large for safety or benefit—what happens is this—that patients who do well first with the ordinary common or garden treatment suddenly get worse, the whole trouble having flared up again as the result of a heroic dose of tuberculin, which has completely upset the patient's immunity.

Another unfortunate thing is the undoubted tendency of the present day laboratory worker to decry clinical medicine. Living shut apart in laboratories they quite fail to realise the strides made by clinical Medicine in the



use of exact methods of examination. A number of cases have been treated under the expert advice of Vaccinists alone, quite independent of any Therapeutic measures. Is it wonderful then that cures were not obtained? The attempts to capture clinical Medicine by Laboratory workers has been a sorry chapter in the history of Medicine. The Laboratory worker ought never to take the responsibility for the complete treatment of a patient, he should work in the closest Mutual co-operation with the clinical worker and the clinical worker should retain the responsibility for the whole treatment. The problem is not solved simply by paying attention to the bacteria. Patient's clinical examination will require to be as thorough as ever. Both factors vary, the bacterium and the patient. The bacterium then must be examined completely in every case in the laboratory, but the other variable factor, the patient must still be examined as carefully as ever in the ward. At present there is a risk of the poor patient being left forgotten to perish in the ward while the bacterium is being petted and pampered in the laboratory.

VARIETIES OF VACCINES.

(a) *Autogenous*.—These are prepared from organisms obtained from the patient himself. These are specific to the organism found in association with the disease.

(b) The next variety is the stock Vaccine. These are prepared from Laboratory cultures. As a rule these are not very Toxic and are degenerated ones on account of the long time they are stocked. These are the ones that are always available to the general practitioner and which are as a rule of no avail.

Whether autogenous or stock—there are 4 different kinds of Vaccines in use, namely :—

(1) *Bacillary Emulsion*.—Almost all the Vaccines are of this kind. These are emulsions of the organism in normal saline. The living organisms are killed by the addition of 5 per cent. phenol. Heating is to be avoided in the preparation of a Vaccine and the minimum of anti-septics should be used. That is the only way of maintaining the efficiency of a good Vaccine.

(2) The next kind of Vaccine is the *Sensitized* one. This was originally introduced by Besredka, in which the bacillary emulsion is treated with the corresponding specific anti-serum, that is, the serum of an animal immunised against the particular bacterium and after being left in contact for some time, the serum is separated by the centrifuge and the bacteria are thoroughly washed from all traces of serum. It is claimed that, while immunity produced by this kind is rapidly developed and is of long duration, the local toxic effects on subcutaneous injection are very much lessened. Favourable results have been recorded by the use of this kind of Vaccine—but my experience is limited in the matter of these, and the general opinion is that these Vaccines generally become septic during the process of sensitization.

(3) *Detoxicated Vaccines*.—These are prepared by treating the bacilli with 10 per cent. solution of caustic soda, thereby destroying the dangerous toxin. These have been started by Thompson on the assumption that bacterial endotoxins do not produce any antibodies and are consequently undesirable constituents of a Vaccine and Thompson is the strongest advocate of these kinds of Vaccines. It may be that he has at length solved the

problem, but time alone can show. His contention being that the old time-honoured Vaccines, used in small doses, were not able to produce complete immunity, whereas if even in large doses their effect was toxic and harmful and tended to destroy immunity. Meantime Wright and his school have shouted without ceasing their postulate that if small doses of Vaccine produce some immunity, large doses must produce more immunity. When tested by clinical experience, this A B C statement has proved false and has done much to discredit Vaccine treatment. If it turns out that Thompson's view is correct, that the dangerous toxin can be removed from the bacterial body, and the bacterial body then be used in larger doses to produce high immunity to the specific protein of the bacterial body, then a step forward will have been taken. Still the clinical proofs of cure in these cases are not very satisfying and reliance as a test of cure is placed on the 'complement Fixation Test.' The value of detoxicated Vaccines is still far from proved and needs some years of further investigation before it can be fully established. It is therefore most unfortunate that they have already been taken up on a commemorial basis and advertised like patent pills, before their value has been accurately appraised. "Stunt" medicine has always been fashionable, but like other fashions it seldom outlasts a season.

We know that some people show dangerous anaphylactic symptoms when injected with foreign proteins. It seems certain then that some sensitive individuals will show dangerous symptoms when inoculated with large doses of detoxicated Vaccines, however little they may harm the average individual, just as happens in the case of anti-diphtheritic and anti-tetanic serum.

(4) The fourth kind is *Dreyer's Defatted Vaccine*. So far, this is applied only in the case of the Tubercle Bacillus, in which the bacilli are treated with Formalin and Acetone. The method is complicated and aims at removing the fatty waxy capsule, so that the bacilli are no longer acid-fast. These non acid-fast organisms are supposed to be assimilated by the tissues better.

Dose and Spacing of the dose.—Dose of a Vaccine is arrived at (i) after ascertaining the toxicity of the organism. High toxicity, it is safer to start with 1 c.c. of 10 million organism and even less. With low toxicity ones, the initial dose should be 100 millions.

(ii) *Stage of the disease.*—In acute diseases the dose should be very small and should be slowly, carefully, and gradually increased. In chronic diseases, large doses should be given if there is not much affection of the general health, e.g., in Boils, etc., 250 millions could be given as an—initial dose.

(iii) *The Patient.*—An individual and personal factor—In determining the dose of a Vaccine, the age, sex, colour and size of the patient ought to be taken into consideration. The first dose is always and usually is an experimental one and the spacing and the increasing of the doses ought to be controlled by the focal and general reactions. The local reaction gives us an indication as to the right organism or not.

Spacing of the dose.—The first doses should be given at intervals of 3 or 4 days and when the maximum is reached, weekly intervals ought to be allowed in between.

With low Toxicity Vaccines increasing dose by multiples, like 10, 20, 40 and so on,

With High Toxicity Vaccines and in sub-acute diseases, one cannot increase doses so rapidly, *e.g.*, in Shiga Bacillus Vaccine, 10, 15, 20, 25 millions should be given, each time judging by the focal and general reactions.

Inoculation.—The Vaccine ought to be injected into the corium and not into the subcutaneous fat. By doing we get better immunising response. The cutting stage of the needle ought to be parallel to the skin. Besredka states that a Vaccine is the more active and effective, the nearer to the site of the trouble it is injected. The present fashion and rage of the day is by the intravenous route. Space and time does not permit me to dilate more on this route here at present, since it involves the consideration of other and more important topics as the "Non-Specific Protein Therapy" and "Immuno-Transfusion." To those who are interested in the subject of Immuno-Transfusion, I would recommend them to read the November Issue of the Madras Medical Journal, wherein you will find an original article by my friend and class-mate Dr. S. Ramakrishnan, L.R.C.P. & S. of the King Institute, Guindy. In the meantime I would suggest and I wish that some one from this assembly should take up the consideration of "Non-Specific Protein Therapy" as the subject for our next meeting or "Insulin Therapy."

Keeping power of the Vaccine.—For the first 3 months after preparation these are very toxic and the immunising property is very good. From 3 to 6 months these are not so toxic, but the immunising property just as good. From 7 to 12 months toxicity very less and the immunising power is considerably reduced. To avoid these changes, Vaccines ought to be kept in a cool place and in a dark room,

Heating should be avoided and the minimum of anti-septics should be used.

To know if specific organism has been obtained.—This is judged by the local reaction. Redness and slight swelling of the part at the site of injection, which redness in a few days changes to a brownish colour followed by desquamation.

Focal Reactions.—These are exhibited at the site of the disease. Large doses of Vaccine increase the symptoms. If the dose is right and the spacing is correct, amelioration of the symptoms take place, followed by recovery.

Duration of the Immunity.—Supposed to last for about 2 years. Depends largely on the individual factor and roughly lasts from 6 months to about a year and a half. With some Vaccines, the immunity is very short lived, especially in streptococcal infections, *e.g.*, Dermatitis due to streptococci.

Uses of Vaccines.—(1) *Prophylactically* the value of Vaccines is undoubted. Extensively used in the prevention of Typhoid, Para. A & B Cholera, Influenza, Plague, Hay-fever, etc. In almost all, the doses are very small, except in Plague.

(2) *Curative value.*—Could be used in almost all bacterial infections. Should be used only in sub-acute and chronic cases, as immunity takes time to develop, at least from 10 to 15 days and the immune substance must reach the site of the disease. Generally used in skin affections by the Staphylo and Streptococcus—Boils—Eczema, Acne, etc.

Lung diseases.—Such as chronic Bronchitis, Asthma due to Bronchitis (Bronchial Asthma) and in chronic unresolved Pneumonias.

Bowel Complaints.—In chronic Bacillary Dysentery, in duodenal ulcer, etc.

In diseases of the genito—Urinary Tract—for Cystitis B. Coli and proteus cystitis. In phlegmesia alba dolens (white leg) when due to streptococci.

In surgical affections.—Treatment by surgery should be done first. Vaccines help in the healing of the wound and in reducing scar tissue.

Nose and Throat work.—Results are disappointing—reason being that most infections are on the surface. So far as I can gather we cannot manage to get rid of bacteria from the surface of mucous membranes. It seems a well known Vaccinist once wrote to a patient “You have 12 different kinds of bacteria in your throat. I have prepared a Vaccine of these and shall inoculate you regularly.” After some months treatment he wrote, “Your throat now contains no bacteria and is sterile.” The patient being sceptical however took another doctor’s opinion and needless to say his throat proved to be far from sterile.

Actinomycetales.—Tubercle Bacillus—In bone and gland affections tuberculin acts very well.

In Glanders.—Results very disappointing.

(3) *Increase the resistance.*—In the treatment of simple Parenchymatous Goitre.—Any Vaccine will do—the only thing that is needed is the bacterial antigen.

In Spræ.—Streptococcal Vaccine is used and Chronic arthritis is also accordingly treated by mixed Vaccines.

Rules for the use of Vaccines.—(1) Seldom, if ever, in acute cases, while the fever is high and the symptoms urgent. In acute cases when the fever is high, the body is already flooded with an excess of bacterial poison and is engaged in a delicately balanced struggle to obtain the

mastery. How unwise then, must it be to give the body an added dose of the poison. If the body is already producing antibodies, surely these must at once fix the dose of the Vaccine. If, on the other hand, it is receiving already an overdose of bacterial poison, so that it cannot produce antibodies why should an added dose of the same poison do other than knock out still more the attempts at resistance.

2. In chronic cases always, but keep to small doses. If you raise the dose, watch the result very carefully. If the symptoms do not improve or get worse, it is clear that harm is being done. In such an event go back to a small dose.

3. Heroic doses should not be given until the cause of the toxicity of Vaccine is solved. Heroism is not synonymous with good work.

4. Never give Vaccines until you have made a complete clinical examination and are convinced that bacteria are not pocketing somewhere. Adequate surgical drainage will work far more quickly than any Vaccine in combating a bacterial infection.

5. If the case is cured by nature before the Vaccines could be got ready as often happens, let well alone and do not give the Vaccine.

6. Do not forget the value of the auto-inoculation as a method of producing immunity. This is true ‘*Vaccine Therapy*.’ Prostatic message is a good example. Do not forget that bacteria are not the sole cause of bacterial infections. Bacteria are simply the proximate exciting cause. The predisposing causes are of equal importance and should never be forgotten in treatment. To treat the Vicious circle of predisposing causes is as effective

in cases of bacterial infections as to break the bacterial circle. Finally adequate surgical drainage is the best method of treatment of bacterial infections. To secure adequate surgical drainage demands the highest surgical skill.

Abuse of Vaccines.—(1) In acute diseases because immunity takes time to develop 10 to 15 days and in some cases 3 to 6 weeks. (2) When surgical treatment is needed, for example, in Tubercular caseating glands, sinuses with necrosed bone at the bottom or with foreign bodies, Empyema of the antrum, etc. (3) Diseases which are better treated by drugs—Impetigo Contagiosa, etc. (4) The use of mixtures of Vaccines.

The Limitations of Vaccine Therapy—

- (1) Time for Immunity to develop.
- (2) The organism must be in contact with the body fluids—Say in Ring-Worm of the skin—Vaccines are of no use.
- (3) Prevent and cope with secondary infections, especially in secondary infections of the lung and bowel.
- (4) Tendency for Vaccinist to forget the value of Medical and surgical methods. In other words there should be regular team work.

In causes of failure —

- (1) In not diagnosing the disease properly and its causation.
- (2) Individual factor of the patient, age, sex, colour, size, etc. Hypersensitiveness in the patient.
- (3) Too large or too small a dose—small doses of Vaccines are favourable in their action and should be employed. But with large doses such Vaccines are not only dangerous but often positively harmful. By large

doses, I mean doses of from 1000 to 4000 millions—which are some times exhibited by enthusiasts. With such large doses the toxic effect of the vaccine far outweighs any immunizing effect. In some cases—such cases produce a long negative phase in which the patient's resistance is profoundly lowered and he is unable to react to other forms of treatment even. In others they make patients feel extremely ill and cause such symptoms as collapse and painful swellings of the joints. In some cases it brings on a fulminating attack.

Ladies and gentlemen, in bringing this subject to a close this evening, my message to you is to go ahead with your Vaccines—and there is a bright future for the same.

GLEANINGS.

A NEW OUTLOOK ON MIDWIFERY.

BY MARY C. DE GARIS, M.D., B.S.

(From 'The Medical Journal of Australia'—July 3, 1926.)

The new definition of Normal Labour was published in *The Medical Journal of Australia*, August 22, 1925, and runs as follows:—"A normal labour is one in which the Uterine contractions act thoroughly efficiently leading in a short time to the spontaneous delivery of a healthy baby and causing but little or no distress or pain to the mother."

This definition is physiological in its character, concrete in its terms and absolute as a standard. It is not impossible, as is proved by the occasional occurrence of cases of painless labour.

By it, a labour pain is relegated from its unique position of being regarded as a physiological pain to the

more reasonable place of being looked upon as equally pathological with any other pain and as being indicative of faults in labour, that is pain in labour is a useful signal of ill-health just as is other pain elsewhere in Medicine and Surgery.

On criticism, the definition is found to be functional in its terms and to cover the action of the uterus itself, the condition of the infant and the effect on the mother. Most people will have no difficulty in accepting the first two clauses of the definition, but will look askance at the third. In the hope of converting doubt to approval, I here briefly recount the steps by which I reached this definition. It was not reached at one bound by myself, far from it; it took twenty years of wonder and two years of steady thinking to develop the main idea: neither is it likely to be so reached by my hearers, though I hope that they will ascend the steps more speedily than I did.

From the time of my student days the thought of pain in labour has lain both as a resentment and as a problem in my mind, sometimes almost subconscious, sometimes erupting into activity from contact with some special circumstance, as for example a very difficult labour or on the other hand a very easy labour. No one ever considered the pain a problem. It was one of the things that had to be endured and the curse of Eve was its final and sufficient explanation. If this curse were taken as the first recorded explanation of what was regarded as a problem even in those early days or as the punishment for eating wrong things (as it probably is) it would not be so far out after all!

While I was resident as a young graduate at the Women's Hospital, Melbourne, two women were admitted,

one of whom said that she had had no pain during labour and the other of whom said that she had had one pain. Their babies were born before admission. Soon after going to Geelong, I attended a case of very easy labour and so had my attention forcibly drawn to the matter again.

Long sure that such pain was pathologic, I could offer no explanation of its occurrence and neither apparently could anyone else. Sir James Mackenzie had in his "Symptoms and Their Interpretation" described labour pain as a referred visceral pain, but offered no reason for its occurrence. It was clear after his work that symptoms preceded signs and were of diagnostic value, but of what was labour pain a symptom and how could it be used in diagnosis? The answer to these questions flashed across my mind when reading McCollum's "Newer Knowledge of Nutrition." He clearly shows that fertility, viability, lactation, duration of life and vigour depend largely on the diet. If the mother and the product of labour are affected by her diet, surely the process of labour is also thus affected. It seemed obvious, therefore, that pain was an indication of faulty labour, of faulty uterine action, of uterine inertia. The artificiality of our diet would explain the commonness of pain in labour and the varieties of defects that might and do occur in daily diet. would explain the immense variation in labour pain as seen in practice by every one of us, while the more satisfactory diet of country districts accounted for the traditional and well accepted fact that countrywomen suffered less than townswomen. Of course other errors in the general health, as focal sepsis, play an important part too.

That the humoral condition, the constitution of the blood, is of importance to health and efficiency, probably

including uterine efficiency also, is sufficiently proved by a consideration of "Insulin" reactions in the clinic and the effect of Ringer's fluid on cardiac contractions in the laboratory.

Instead of adopting the average experience of labour as our standard, we should really adopt the best and easiest labour known as our standard.

I therefore accepted pain as an indication of uterine inertia and began to evolve my definition of normal labour. In the definition of normal labour we should find the standard by which to measure and classify the variations of average labour, the first step necessary to discover their causes.

Such a radical change in theory as an alteration of the definition of what constitutes the normal must have enormously important implications in any science or art and obstetrics is no exception.

Originally an art is based on empiricism, then some inquiring or generalizing mind develops a theory to explain well known facts. When the theory has proved satisfactory, practice is further developed by the use of the theory, so that in advanced arts theory governs practice. An ounce of practice is proverbially worth a pound of theory; but a pound of practice remains a pound, whereas a pound of practice fertilized by an ounce of theory soon becomes a ton. Theory being dynamic may become geometrically reproductive, while practice is but arithmetical. False theory is correspondingly harmful.

That present day obstetrics both needs and receives criticism is obvious to the reader of our journals. All over the world writers attack the results of our obstetric work, but there is no generally accepted explanation of

its failure. The specialist and the teacher say that the general practitioner does not practise the principles he has been taught. The general practitioner retorts that the former do not know the conditions in general practice. He should, however, point out that he does practise the principles he has been taught and very well too, for it is quite easy to do so and that as he is not successful in spite of his care, it must be because there is some other obstetric principle or principles that have been neglected because overlooked.

What are the governing principles of present-day obstetrics? They may be summarized practically as cleanliness to avoid the risk of puerperal fever and the necessity in antenatal care to examine the urine so as to guard against eclampsia and to be on the outlook for a contracted pelvis or an unfortunate lie, so that one may be prepared for the one and correct the other before labour sets in. Mechanics and infection from carelessness are the bugbears of our student days.

In obstructionless Australia if there is difficulty with delivery we blame the pelvis instead of the powers! However, the almost universal advice, even in rickety countries, to try "the test of labour" is in itself enough to prove that it is the uterine efficiency that is most important. Every textbook tells us that most delayed labour is due to *inertia uteri*, while certain authors tell us that the death rate rises with the duration of labour. Surely an understanding of uterine inertia is the fundamental necessity in obstetrics.

Without an absolute standard for uterine action (this we should find in the definition of normal labour) we cannot make progress in its study. In fact no progress

in its study has been made for many a long day owing to this very absence of a standard by which to measure. In the study of the causes of maternal and foetal morbidity and mortality it does not seem to occur to most people that a statistical study of labour itself is necessary to make much real progress or better still of the whole child-bearing entity, pregnancy, labour, puerperium and infant. I do not propose to go fully into my views on uterine inertia tonight, as I am still engaged in a study of this question on which I hope to have the opportunity to air my views at the next Congress. I have, however, made and published a classification of the commoner variations of average labour, using my definition of normal labour as the standard and my theory that pain is the first indication of uterine inertia as the key to the classification. I hope also to succeed in demonstrating the correlation in causation of painful labour and congenital debilities.

In any other science rigid and absolute standards are necessary to successful progress. My definition gives such an absolute standard for obstetrics and not an impossible one. We all know that no two labours are quite alike, that labour shows a different character in different cases. We can now proceed to observe and classify them as a preliminary to seeking causes. The adoption of this definition entails also a functional or symptomatic observation of child-bearing as a whole. Let me mention two cases briefly as instances of functional observation of labour (these cases are to be dealt with in more detail in my paper on *inertia uteri*).

In one the cervix dilated very slowly, taking several days to reach three-quarter dilatation, then going back to the size of a five shilling piece and completely failed to retreat. Rupturing the membranes at three-quarter dilatation made matters worse rather than better. The head was well down from the end of the

eight month and advanced during labour, so that the functions controlling dilatation and expulsion were present though poor, while the function causing withdrawal of the cervix was completely absent. I had finally to finish the dilatation of the cervix myself (quite easily) and deliver through an unretracted cervix. While I was doing so a good deal of bleeding occurred, not from tearing.

What all these things mean I do not know and I am doing a good deal of thinking about them to try and find out, but it does seem clear that they show a separability of the various functions of the uterine muscle and of the fundal and cervical actions.

In another recent case dilatation was very fair, expulsive pains were excellent, the head was so low in the pelvis as to be nearly on the perineum from right at the beginning of labour and yet no progress was made. On attempting to put on forceps I found a very contracted resistant vagina and delivered the patient of a vigorous baby weighing 3.1 kilograms (seven pounds), with its occiput anterior causing a bad tear.

What was the cause of the delay in this case? The child was small, in good position, the pelvis of proper size, the forceps fairly easy, the pains appeared of average efficiency. After hard thinking I came to the conclusion that she had a visceromotor reflex, a contraction of the vaginal and perineal muscles, leading to obstruction and to the tearing of a resistant perineum. Surely both her pain and her contracted vagina were symptoms of a moderate uterine inertia. Compare this with the visceromotor reflex that Mackenzie described in *angina pectoris*.

I wonder if an electrouterograph might play as important a part in the study of the individual functions of the uterine muscle during labour as the electrocardiograph played in a similar study of the cardiac functions. No doubt separable uterine functions can be demonstrated clinically or in any other way only in special cases and these cases will be found only by being sought. A reference to my classification of average labour, however, will

convince anyone that the functions of the first, second and third stages may vary separately or in sequence. How often a tedious first stage, for example, is followed by a speedy delivery, almost as often as by a delayed second stage.

The apparent is not always the real. Just as the earth appears flat and is really round, just as the sun appears to move round the earth, while really the earth revolves around the sun, so the process of labour appears necessarily painful. Yet the occasional case of painless labour shows that theoretically it is not necessarily painful. Just as the theory that the earth was round led to the discovery of America, so may the theory that the normal labour is painless lead to the average everyday labour becoming so.

It always seems disgraceful to me that we are not able to tell a woman why her labour has dragged on for days, while another woman has had a speedy delivery. There must be some explanation for the difference. In all cases we should criticize our patients' dietary, general health, freedom or otherwise from focal sepsis and go into the medical history in the hope of discovering a remediable cause. We will criticize her general health and mode of life when she fails to deliver herself, instead of blaming a guiltless pelvis.

Anyone who has revised his recollection of his cases will know that the duration and efficiency of labour and amount of suffering endured depend chiefly on the duration and efficiency of the first stage. The first stage is clearly a physiological and medical problem and not a mechanical one. The head also is often well down into the pelvis and forceps delivery easy in many of these cases, so showing

that mechanical obstruction is not the cause of the delay and failure in natural delivery. In the practical absence of rickets from Australia we find a golden opportunity for the study of delay in labour, uncomplicated by obstruction.

If it is true (and it is true, though yet to be proved to everyone's satisfaction) that the normal labour is painless, the normal baby vigorous, that the faulty labour, the faulty baby and the faulty pregnancy and puerperium are all correlated in their causation, then the securing of the truly normal labour as the average labour of our community, offers more benefits to our people than any other single medical or other measure. We should then have AI motherhood, AI babyhood, AI nationhood. Probably the consequent increased resistance, the improved diet and mode of living would abolish other diseases whose treatment and whose origin now cost us thousands. The health of mothers and babies should be regarded as an index of the health of the nation. As dysmenorrhœas *et cetera* depend on the general (probably humoral) health, so do dystocias.

Do you wonder that I say that *inertia uteri* is the fundamental problem of obstetrics whose solution solves many other problems too?

Typhoid fever was not abolished in Melbourne by supplying good nurses and doctors and hospitals, but was reduced by boiling the water and scalding the milk and was finally wiped out by the sewerage system. Neither will the maternal death rate be done away with by merely palliative measures.

Few women think of their one in two hundred chance of death from child-bearing. Practically all dread the certain suffering.

Women have been emancipated socially and politically and have even achieved freedom from the tyranny of hampering clothes. The discovery of the causes of pain in labour will emancipate them physically too. May the Victorian school of midwifery confer this great boon on mankind!

I offer my definition of normal labour and my theory of uterine inertia as good working tools for the development of obstetric theory and the consequent improvement of midwifery practice and results.

The chief aim of my paper has been to induce someone with greater clinical opportunity than I have to put my theories to the test. My practice is only big enough to do suggestive work, not to prove anything.

What are the implications of the new definition? They are five in number. The first is the adoption of a functional approach to the study of midwifery. The symptomatology of labour *et cetera* must be observed. Our cases must be classified. Our absolute standard makes classification easy. Classification necessarily precedes the search for causes.

The second is the acceptance of the fact that child-bearing is one clinical entity, occurring in successive stages, pregnancy, labour, puerperium and including its result the infant; that sepsis, toxæmias, hæmorrhages, congenital debilities should be considered as complications of child-bearing itself and not merely of one of its stages as at present. Such a conception correlates them all in causation. Child-bearing is probably a precipitating and not a root cause of illness: it is illness during and not of pregnancy *et cetera*. The use of a tabular analysis of all one's midwifery cases (I use a vertical columnar method)

shows at once the bearing of any detail in any case on any other detail in the same or other cases. For example, such an analysis clearly demonstrates that the febrile puerperium is often directly related to the unhealthy pregnancy. A reliable differential diagnosis between autogenous and accidental puerperal sepsis is still needed. A statistical study and a clinical scrutiny of one thousand cases analysed by my scheme would be most illuminating. It would probably reveal many as yet unnoticed relations. These two points are developed in a brief series of papers in my "Clinical Notes and Deductions of a Peripatetic."

The third implication is that labour, being the most active phenomenon of the whole process and the most readily observed, serves as the main indicator of the health of the whole process. It must therefore be carefully studied and classified by its symptoms and signs in the hope of discovering the root causes underlying the numerous variations seen in everyday practice and of explaining the immense variation of the intensity of labour pain as seen by everyone.

The fourth implication involves the recognition of the importance of uterine inertia as being the central and fundamental problem in obstetrics. Its solution solves many other problems too. With it is bound up pain in labour and the liability to fatal complications occurring during motherhood and foetal and early infant life. Uterine action needs detailed study and careful analysis both in the clinic and in the laboratory. The clinician, having observed his patients in detail and having classified them and having surmized possible causes, will turn to the physiologist and say: "We see such and such variations in practice, we assume that a deficiency, sepa-

ately or together of lime, phosphorus, iodine *et cetera* in the diet may be responsible, is it so ? ” “ Are there separable uterine functions, comparable to the separate functions of cardiac muscle ? ” “ If so, what affects them ? ” “ Does the poisoning from dead and filled teeth affect animal labour *et cetera* ? ” “ If so, in what way ? ” In the clinic much can be done. Certain treatments might be employed and their effect on the character of the labour and the welfare of the baby noted. For example, *liquor sedans* (Parke, Davis & Company) has a remarkable influence on uterine action, as shown by its success in many forms of dysmenorrhœa. I have often found it relieve false pains and afterpains. I mean to try it during pregnancy in those patients of mine who have had specially painful or tedious labour. The effect of single or polyglandular endocrine products should be tried in the clinic. The supply of lime and phosphorus to mother often relieves the unpleasant early symptoms of pregnancy and should be tried on a big scale to determine their effect on character of labour *et cetera*. *Liquor sedans* has also proved useful for the same purpose. To secure normal labour three things are required : that is, besides the healthy mother and the clean labour, a third condition is necessary, knowledge of the factors on which a truly normal labour depends. I appeal especially to the practitioner who like myself is not too busy, who has time to wait and see and think about it. What can the man who “ does not put on forceps if the baby is born,” as one man described his practice to me, know of a normal or even of an average labour ? Ease of labour, good recovery and vigour of infant are the real tests of our antenatal care and knowledge.

Fifthly, we conclude that a knowledge of the physiology of child-bearing, especially of the action of the uterine muscle, is as important to the successful conduct of average labour as a knowledge of the mechanics of labour is to the successful conduct of much abnormal labour.

Such physiological and clinical knowledge does not as yet exist, but it will do so when the need for it is realized and it may bring in its train the substitution of a truly normal or nearly normal labour for the present-day pathologic average labour, with its high percentage of still-born and weakly babies and damaged mothers.

THE Medical Review of Reviews

Monthly Journal of Medicine, Surgery,
Public Health and Collateral Sciences.

ANNUAL SUBSCRIPTION, Rs. 5 Post Free

EDITED BY

**Sures C. Chatterjee, M.B. and
Captain G. S. Chatarji, M.B.**

Contains original articles by eminent
Medical men, Records interesting cases and
special treatment, Presents the World's
progress in Medicine, Surgery, etc.,
critically collated from the medical
publications of all countries.

**RECOGNISED AS THE MOST VALUABLE
PUBLICATION IN THE EAST.**

SPECIMEN COPY FREE ON APPLICATION

BEST MEDIUM FOR ADVERTISEMENT

RATE CARD ON REQUEST

Apply to:—The Managing Editor,

The Medical Review of Reviews

208-1 Upper Circular Road,

CALCUTTA.

NOTICES.

EDITORIAL.

Original articles, Clinical lectures,
Medical Society addresses, and interest-
ing 'cases' are invited. Contributors of
original articles will receive 20 reprints
of their papers *gratis* if asked for at the
time of sending their contributions.

All Editorial communications, reports
and books for review and exchange,
should be addressed to the Editor,
Madras Medical Journal, C/o Messrs.
Hoe & Co., Madras, E.

BUSINESS.

Letters relating to the Publication,
Sale and Advertisement department must
be addressed to "The Manager," "The
Madras Medical Journal," C/o Messrs.
Hoe & Co., Madras, E. The rate of
annual subscription is as follows: Indian,
Rs. 5, post free; Foreign, Sh. 7/6 or its
equivalent, post free. All subscriptions
are payable in advance.

ADVERTISEMENT TARIFF:

	1 Inser- tion.	3 Inser- tions; per Inser- tion.	6 Inser- tions; per Inser- tion.
One page	Rs. 15	Rs. 12/8	Rs. 10
Half page	Rs. 9	Rs. 7/8	Rs. 6
Quarter page	Rs. 6	Rs. 5	Rs. 4

No charge is made for change of Copy.
Special terms for position page.

THE 'PRACTICAL MEDICINE'

(Established 1903.)

P. O. Box 49, Egerton Street,
DELHI.

This monthly medical journal of great
practical value, enjoys an exceptionally
wide circulation among the rank and file
of active practitioners in every quarter
of India, Burma, and Ceylon and other
countries where English language is
spoken. It is eagerly awaited by its
numerous readers, and is read from cover
to cover. Its original articles, selections
and reprints are a great help to busy
practitioners, it economises your expen-
diture for periodicals, it saves your pre-
cious time, it gives you cream of the
world's medical literature and its query
department is of great use to subscribers
in difficult and complicated cases.

It is a leader in the medical advertis-
ing field of India, its advertisers reach
that class of people with whom their
business is chiefly concerned and anyone
with *anything* to sell to a doctor will find
it one of the cheapest and yet most
powerful aids in attaining success.

SPECIMEN COPY FREE.

Advertising rates on Request.

FIVE RUPEES WILL BRING YOU

The Antiseptic

(ESTD. IN 1904.)

Post free every month for a year.

THE Antiseptic, an independent journal
devoted to the interests of medical
men in the Indian Empire, is the *periodi-
cal* for the busy practitioner to keep him
professionally up-to-date.

Edited by

Hon'ble U. RAMA RAU,

Medical Practitioner, and member, Madras
Medical Council, and contributed to by Indians
and Europeans who are in the forefront
of the profession.

Specimen copy free XXIII vol. began Jan. 26

Address all Literary communications to
the Editor and business letters to the
Manager, P.O. Box No. 166, Madras.

The best medium for advertisement.

Rate card on request.

ASSOCIATION NOTES

49

ASSOCIATION NOTES

*Minutes of the Annual General Meeting held on Saturday
the 24th July 1926 with the President Rao Bahadur
Dr. M. Kesava Pai, M.D.C.M., in the Chair.*

1. Consideration of Annual report and Auditor's
statement.

Adopted.

2. Consideration of a proposal to request the author-
ities to extend the Government orders granting daily
allowances to officers studying at the Tropical School of
Medicine, Calcutta, so as to make it applicable to officers
studying at any other recognised institution in India.

Decided to address the authorities on the subject.
(The Authorities have since been addressed.)

3. Consideration of a circular letter from Dr. A.
Krishna Menon inviting the co-operation of the Madras
Medical Association in the formation of a Clinical society,
the membership of which is to be open to all members
of all Medical societies in the City of Madras.

Decided that the members of the Madras Medical
Association may help by becoming members of the new
Association or in any other way they think fit.

4. Consideration of the proposal referred to in the
Annual report for the amalgamation of the Madras
Medical Association and Medical section of the Indian
Officers' Association.

Seventy members expressed their written opinions on
this question—66 for amalgamation and 4 against it. The
Secretary was asked to confer with the Indian Officers'
Association regarding financial arrangements and report
to the Association.

5. Consideration of a proposal to request the authorities to order that the disciplinary rules applicable to gazetted officers of the rank of Civil Assistant Surgeons shall secure to them the same safeguards as those enjoyed by gazetted officers of all departments in general, viz., that orders of suspension, stoppage of increments and the like shall not be passed without the sanction of the Local Government.

Decided to address the authorities on the subject. (The Authorities have since been addressed.)

6. Election of office-bearers (including the Auditor). The following office-bearers for the current year were duly declared elected:

President.

Rao Bahadur Dr. M. Kesava Pai, M.D.C.M.

Vice-Presidents.

1. Rao Bahadur Dr. T. M. K. Nedungudi, L.M. & S.
2. Rao Bahadur Dr. K. Madhava Menon, L.M. & S.

Executive Members.

1. Dr. M. R. Guruswamy Mudaliar, B.A., M.D.
2. Dr. H. S. Hensman, M.R.C.S., L.R.C.P.
3. Dr. T. S. Tirumurti, B.A., M.B.C.M.
4. Dr. K. Koman Nayar, L.M.S., L.R.C.P. & S.
5. Dr. G. R. Dinker Rao, M.D.
6. Rao Bahadur Dr. A. Lakshmanaswamy Mudaliar, B.A., M.D., *Hon'ry. Treasurer.*
7. Dr. G. Srinivasamurti, B.A., B.L., M.B.C.M.
8. Dr. A. S. Mammady Nayar, M.B.B.S., PH.D.
9. Dr. P. Venkatagiri, M.B.C.M.

Auditor.

M. P. Ry. Y. Ramaswamy Ayl., G.D.A.,
Govt. Diplomed Auditor.



V. Perumall Chetty & Sons

5, STRINGER'S STREET, MADRAS (India)

LARGEST IMPORTERS OF

Paper and Stationery and Suppliers to S.I.Ry. Co., Ltd., District Boards and Municipalities, besides Estates and Private Firms

HOE & CO. The "Premier" Press

PRINTERS :: ENGRAVERS :: BOOK BINDERS, Etc

CONTRACTORS TO

S.I.Ry. Co., Ltd., Local Funds, Municipalities and District Boards in the Presidency, University of Madras and other public bodies

The Madras Pencil Factory

MANUFACTURERS OF

Black-lead, Copying and Coloured Pencils of all grades

SUPPLIERS TO

Govt. of India, Govt. of Madras and other commercial bodies

Dii Merck's Vinum Grapes

To infuse vigour into the body, to enrich blood, to vitalise a dying patient, to improve appetite and to ensure natural evacuation of the bowels you must not forget to use Vinum Grapes. It is highly efficacious in Fevers, Bronchitis, Pneumonia, Asthma and Phthisis. It produces wonderful effects in Leucorrhoea, Menorrhagia and Metrorrhagia.

Price Rs. 4-8 per bottle.

To be had of:—MESSRS. M. BHATTACHARYYA & Co.,
8/4-A Clive Street, Calcutta. B. K. PAUL & Co.,
KONGRAPATTY, CALCUTTA.

Dii Quinine WONDERFUL GERMAN DISCOVERY.

Dii Quinine is tasteless and is free from any bad effects like ordinary Quinine. It remits all kinds of Fever and stops it like a charm. It can be used before or during Fever.

Full particulars on application. SOLD EVERYWHERE.

1 oz. phial Rs. 3, V. P. Extra.

AROVARSON.

A wonderful injection for Syphilis and Malaria, only three injections required for sure cure of Syphilis and all kinds of Malaria.

Sole Agents:

M. FRIENDS & CO.,
Hathkela, CALCUTTA.

Available at Madras from:

Messrs. SRI KRISHNAN BROS.,
323, Thambu Chetty St., MADRAS, E.

Evidence of Merit

