make sure that the hepatic ducts also are explored, otherwise there may be a recurrence of common-duct obstruction later; this I believe to be a not uncommon cause of such recurrence.

5. POST-OPERATIVE TREATMENT

The pre-operative technique should be carried on during and after operation. In addition 10 per cent. CO₂ in oxygen should be given until the patient takes four or five deep breaths, and repeated three or four times an hour during the first twenty-four hours or so. I think there is no doubt this lessens the incidence of post-operative atelectasis. Flatulence and vomiting are very seldom post-operative features when spinal anaesthesia has been used.

Conclusion

A collective investigation on stone in the common duct by the Association of Surgeons of Great Britain and Ireland in 1932 showed a mortality of 14.65 per cent. in 621 cases. The period to which these figures apply was for the most part before the importance of pre-operative preparation was fully realized. Since that date my figures show a mortality of 4.7 per cent. in eighty-four cases of stone in the common duct, and practically all these patients received the most careful preparation.

I feel sure the biochemical considerations involved in this preparation are of the greatest importance, and indicate that in order to make patients safe the surgeon must be in possession of knowledge which carries him far beyond the limits of operative technique and skill, however excellent these may be.

NUTRITIONAL NEEDS IN PREGNANCY*

BY

SIR ROBERT McCARRISON, LL.D., M.D., F.R.C.P.
Major General I.M.S. (Ret.)

Last year, at the inaugural meeting of the Section of Nutrition in Oxford, I ventured to predict that the day was not far distant when, instead of one morning being devoted to its work it would rank with the Section of Medicine as a three-day fixture. To-day my prediction is two-thirds of the way towards fulfilment. And it is perhaps fitting that the Section of Obstetrics and Gynaecology should be the first to ally itself with that of Nutrition. By this alliance and by the application of the principles of nutrition to the mothers of our race and to their children we begin at the beginning to lay the foundations of a more healthful existence for our people—a finer structure of national health. For, as Carrell has recently reminded us, "nutrition is synonymous with existence"; synonymous, that is to say, with the act of living, with the exercise of the vital functions. To this I would add that faulty nutrition is synonymous with faulty existence, with the faulty exercise of the vital functions.

For the student of nutrition there is no more enlightening experience than to observe the behaviour of cells under cultural conditions *in vitro*. Soon he perceives that their growth, their reproduction, their structure, and their functions depend not only on the composition of the fluid medium in which they are immersed but on the removal from it of the waste products of their activities. So it

is with the human body: that vast aggregation of cells, living, moving, and having their being within the closed circuit of the blood stream. For them the continual purification of the fluid medium in which they live is as necessary to their well-being as its continual enrichment with essential nutrients. It is to these two ends that the processes involved in the function of nutrition are directed and co-ordinated. Inspiration, mastication, deglutition, digestion, absorption, and circulation: these are the supply services. Exhalation, perspiration, urinary excretion, and defaecation: these are the sanitary services. The central act—assimilation—in the series of processes involved in nutrition is a function of living matter, dependent on the efficiency of the supply services on the one hand and on that of the sanitary services on the other. To the cell belongs the task of nourishing itself; to us, as physicians, belongs the task of enabling it to do so by our supervision of the efficiency of these two services.

Nutrition, then, is the sum of the acts or processes by which the structure and functions of all organs and parts of the body—including, of course, those that subserve the function of reproduction—are established and maintained. It is, in short, that function of the body by which health is maintained: health, which implies the ability to produce and rear offspring fitted to live and efficiently to perform the functions of their species.

Continued Efficiency of the Function of Nutrition

It is customary to speak of nutrition in pregnancy as though it differed in some directions—in the supply of certain food essentials, for instance—from nutrition at other periods of life. Indeed, the very title of our subject suggests such a distinction. It is customary also to speak of pregnancy as though it involved an additional burden on the maternal organism, as, unfortunately, it often does. But I suggest to you that the nutritional needs in pregnancy are those necessary to the continued efficiency of the function of nutrition throughout life. For in this efficiency the efficiency of that other fundamental function of the body—reproduction—is inherent. As well might we regard the taking of a steep hill as a feat additional to the normal function of a motor car as regard the making of a seven-pound baby as a feat additional to the normal function of woman. The properly constructed car, the properly adjusted, oiled, greased, fuelled, and tended car takes the hill in its stride; the properly constructed, adjusted, fuelled, and tended woman takes pregnancy in hers. It is this construction, this adjusting, this fuelling, this tending, that, in the perfection of its operation, the function of nutrition effects. But the case is different with the ill-constructed, the ill-adjusted, the ill-tended woman, in whom the function of nutrition from infancy onwards has been faulty. Then, indeed, pregnancy becomes a feat to which some succumb and from which many emerge with some weakness exposed, some permanent damage incurred. It is not, however, with the ill-constructed, the ill-adjusted, the ill-nourished, the ill-conditioned that I am here concerned, but with the Rolls-Royce of womanhood, or for that matter with the dependable Baby Austin or Morris Minor. It is to the production of these—aye, to their mass-production—that we must direct our energies, though the salvaging, the patching-up, of wrecks must still remain our portion.

The nutritional needs in pregnancy are, I repeat, those necessary to the efficiency of the function of nutrition. Their satisfaction must begin not with conception but with the ante-natal life of the mothers of our race. It

* Read in opening a discussion at a joint meeting of the Sections of Nutrition and Obstetrics and Gynaecology at the Annual Meeting of the British Medical Association, Belfast, 1937.

must continue throughout the period of their growth and development up to, during, and following that period when they find their fulfilment in motherhood: a fulfilment for which nutrition prepares and makes ready the way—sometimes well, sometimes ill, according to its perfection or imperfection. It is impossible to dissociate reproduction from nutrition. It is impossible to dissociate reproduction from the acts and processes involved in nutrition. Respiration, digestion, absorption, secretion, circulation, assimilation, excretion: these are prologues to the crowning act of the imperial theme of motherhood.

Four Things Needful

What, then, are the things needful to the efficiency of the function of nutrition? They are:

First, the adequate provision of the materials with which this function is effected: oxygen, water, properly constituted food, and a substance or substances produced in the skin by the action of sunlight.

Second, the efficient performance of each one of the acts or processes involved in nutrition, these acts or processes being themselves dependent on the proper nourishment of the organs and tissues performing them.

Third, the practice of measures and habits of life favourable to the efficiency of the function of nutrition: appropriate exercise in the open air, proper breathing, agreeable mental occupation, promotion of the function of the skin by bathing, suitable clothing, and exposure of parts of the body to such sunlight as is available, promotion of the action of the kidneys and bowels by proper food and the free consumption of water.

Fourth, the avoidance of all influences that adversely affect the function of nutrition: such, for instance, as insufficient rest and want of sleep, bad ventilation, insanitary conditions generally, worry, emotional excitement, constipation, alcohol, and infection.

These are the nutritional needs in pregnancy as they are the nutritional needs of the body throughout life. Their satisfaction makes of pregnancy one of the happiest, the most healthful, periods of a woman's life.

Dietetic Requirements in Pregnancy

This brings me to that section of our subject which, to judge by the programme before us, is to occupy the remainder of this morning's session: dietetic requirements in pregnancy. I shall not attempt to discuss these requirements in detail, but will content myself with an enumeration of the foodstuffs which, if properly produced, properly treated, and properly combined, provide all the food essentials the prospective mother needs. These foodstuffs are, in order of precedence: (1) Milk and the products of milk (butter, cheese, skimmed milk, buttermilk). (2) Whole or lightly milled cereal grains; in particular a good wholemeal bread or standard bread, and oatmeal. (3) Green and leafy vegetables. (4) Root vegetables, particularly potatoes, carrots, and onions. (5) Fruit, including the tomato. (6) Pulses. (7) Egg. (8) Meat, including fish, fowl, and glandular organs. To these there must in this country be added cod-liver oil, not in the large doses commonly prescribed but in the sufficient dose of a teaspoonful daily. And as an additional assurance of functional efficiency of blood, muscle, and nerve, a portion of yeast extract is a wise precaution.

Those of you who have studied the revised report of the Technical Commission appointed by the League of Nations to define the nutritional needs of the human being in the course of development from conception to

adult age will be aware that it is from these foodstuffs that the Commission prepared their dietary schedules for all periods of life up to and including pregnancy. They had in mind, no doubt, the preparation of the female of the human species for motherhood.

Animal Protein: Wholemeal Bread

One revision of this report has been made, and I hope that the next one, already foreshadowed, will remove what, in my opinion, are three blemishes on its excellence. The first of these is the unnecessarily high amount of animal protein (68 grammes out of a total protein content of 105 grammes) it prescribes. The 40 grammes provided by milk and cheese are sufficient—though an additional 10 grammes may be provided by liver, fish, or meat—sufficient, that is to say, if whole cereal or lightly milled cereals be used instead of highly milled ones and if more green-leaf vegetables be included in the diet. Physiological as well as economic prudence forbids a greater intake of animal protein than is needful.

My second criticism is the insufficient insistence on the use of wholemeal bread. "*White flour* in the process of milling is deprived of important nutritive elements. Its use should be decreased and partial substitution by *lightly milled cereals*, and especially *potatoes*, is recommended." This exhortation is well enough so far as it goes. But it is complete, not partial, substitution that must, in my view, be at all times and in all places insisted upon. For the important nutritive elements of which white flour is deprived include the vitamin B complex, vitamin E, an unidentified haemopoietic factor, the proteins of the germ and bran which are of relatively high nutritive value and so constituted as to supplement those of the interior of the grain, and fibre, which is of particular merit in ensuring the efficient action of the bowels. It is folly to deprive bread—the staff of life—of nutritive elements so important to the well-being of the body whether in pregnancy or at other periods of life.

Fresh Vegetables and Fruit

The third criticism that I have to offer is the relative paucity of fresh green vegetables and raw ripe fruit in the dietary schedule. These should form a large part of the daily diet. It is not alone for their vitamin C content that they are of such value, but for their proteins which, though small in amount, are of high biological value, for their mineral contents, and for their utility in maintaining the balance between alkali-yielding and acid-yielding ingredients of the food.

Not long ago I came across an injunction given to pregnant women by Scevole de St. Marthe in the sixteenth century. It is worth repeating, though no doubt it is familiar to many of you:

"Let neither Grief, nor Fear, nor boundless Joy,
The peace and vigour of thy Mind destroy.

Refresh thy weary Limbs with sweet Repose,
And when Fatigued thy heavy Eye-lids close.

... be careful, how your Meats you chuse,
And chosen well, with Moderation use.
With too much Food your Stomach ne'er oppress
And let it as 'tis richer, be the less.

Mix Water with your Wine to quench your Thirst,
And never let the last exceed the first.
Fruit, Herbs, and Sallads when the Body's dry
The want of Moisture will as well supply.

Don't, till 'tis Born, defer thy Pious Care,
Begin betime, and for its birth prepare."