conditions, if at all, does the transmission of tuberculosis from animals to man take place, and what are the circumstances favourable or unfavourable to such transmission? they hold—

(a) That the unmodified avian tubercle bacillus is a negligible factor in the production of human tuberculosis;

(b) That animals capable of suffering from tuberculosis of the human type in a severe generalised form are comparatively few; that none of these active multipliers of human tubercle are common food animals, and that the cow under natural conditions has never been found to eliminate human tubercle bacilli in her milk; that the pig, however, must be regarded as a possible source of infection to man, as the human type of bacillus has been demonstrated in the tuberculous lesions occurring in this animal;

(c) That although only rarely has a pulmonary lesion in man yielded the bovine bacillus, in nearly one-half of the cases of young children dying from primary abdominal tuberculosis examined, the fatal lesions could be referred to the bovine bacillus alone. Moreover, in children and adolescents suffering from cervical gland tuberculosis, a large proportion of the cases examined were the result of infection with the bovine tubercle bacillus.

Finally, the Commissioners record their profound conviction that (a) a considerable proportion of the tuberculosis affecting children is of bovine origin, more particularly that which affects primarily the abdominal organs and the cervical glands; (b) both these forms of tuberculosis are often due to ingestion of tuberculous infective material; and (c) much of the tuberculosis of childhood must be ascribed to infection with tubercle bacilli of the bovine type, transmitted to children in meals consisting largely of the milk of the cow.

CONCLUDING REMARKS.

Mr. President and Gentlemen, I am afraid that in trying to enter into such an enormous mass of detail I may have put too great a tax on the patience of this Conference. I thought it well, however, in view of the differences that still separate various schools of workers on this subject, to place the results of the Commission before you and ask you to accept or reject them on their merits, and not because they have been obtained in this school or that. All here are desirous of coming to well-founded conclusions. The matter at stake is the health, not of a nation only, but of a great part of the population of the world.

If differences still exist between us, must it not be that special conditions prevail in certain countries—conditions that are not present in others? It has been suggested that different methods are used in different laboratories, and that this may account for the different results obtained. Has not the time come, then, for us to inquire into these conditions? Why should we in England be able to find two undoubted cases of "bovine tuberculosis" of a distinctly pulmonary type, and these amongst only 28 hospital cases specially examined, or over 7 per cent., whilst all other recorded observations carried out on the same lines give only two other cases out of over 770 patients examined, or only 0.26 per cent? I maintain that this should be followed up, and that a similar investigation might be carried out in Edinburgh (where many years ago I found so much tuberculosis in children, the origin of which tuberculosis I believed to be bovine); the proportion of adult cases might be higher still. I mention this fact as I am informed by Dr. James Ritchie that some such investigation may be set on foot. Then, too, has not the time come for us to test one another's methods on a large scale? This would involve an enormous amount of work, but is surely worth consideration if thereby we can get into closer agreement on this important matter.

I certainly am not at one with those who maintain that bovine tuberculosis is a negligible quantity in respect to the spread of tuberculosis amongst human patients. I am of opinion, rather, that as we go more deeply into the subject, and extend the scope of our inquiries, the bovine side of the question comes to take a larger and larger place in our scheme, especially, of course, in connexion with surgical and abdominal tuberculosis, but also, in a minor degree, in pulmonary tuberculosis, not only in the child, but even in the adult.

We are in no danger of minimising the part played by infection to and from the lungs. We all agree on that, but I and others still maintain that the "bovine" aspect of the question must not be neglected either on its experimental, its clinical, or its preventive side.

THE MEDICAL TREATMENT OF CHOLELITHIASIS.

By PAUL MAYER, M.D.

IN recent years our views upon gall-stones have undergone a substantial modification, mainly attributable to the great advances in the surgery of the liver and gall-bladder. By these examinations *in vivo* we have gained a deeper insight into the pathological processes in cholelithiasis, and through this experience we are now enabled to make far more accurate diagnoses than were possible before the surgical era. The remarkable results of the surgical treatment of gall-stones are universally recognised, and the physician has certainly learnt to appreciate many dangers of the complaint which were perhaps formerly under-estimated. No agreement between physicians and surgeons as to the indications for surgical interference could at first be attained, because certain operators regarded the operation as indicated after the first attack of biliary colic and claimed cholelithiasis for their own exclusive domain. A solution of the divergent views could be achieved only after the most distinguished surgeons had substantially limited the indications for operation. We know to-day that in spite of the perfection of surgical technique the dangers of operative interference are not to be neglected, that the operation does not absolutely protect the patient from recurrence, and that the adhesions occasionally resulting from the operation may give rise to considerable discomfort and pain. On the other hand, the results of medical treatment are very satisfactory if it is instituted immediately after the first attack of biliary colic and is carried out in the correct manner. It is only possible to draw up quite general rules as to the indications for operative interference, since the question of operation has to be decided in each individual case after careful consideration of all the factors concerned. According to my own experience the following indications for an operation appear to be established and to coincide with those of most surgeons of the present day.

1. Acute cholecystitis should be treated medically; only the most severe form, cholecystitis acutissima, belongs to the surgeon.

2. Chronic relapsing cholecystitis should be treated by operation only when all the suitably employed agencies of medical therapy have failed.

3. Operation should be performed in chronic obstruction of the ductus choledochus if two to three months of medical treatment are without effect. In cases with prolonged remittent fever, rigors, and bad general condition the operation is unquestionably indicated.

4. Hydrops vesicæ felleæ demands operation only if there are persistent and very severe irritative phenomena.

5. Empyema of the gall-bladder and all suppurating processes in the region of the gall-bladder and in the liver should be operated upon.

6. Adhesions about the gall-bladder should be treated medically so long as the inconvenience produced is not marked. In the most severe cases operation is required.

7. Acute and chronic pancreatitis resulting from cholelithiasis belong to the surgeon.

When it is remembered that all the forms and complications of cholelithiasis for which an operation is indicated are relatively uncommon in proportion to the remarkable frequency of the complaint, it is obvious that for the great majority of patients with gall-stones medical treatment alone comes under consideration. A uniform conception concerning the methods and objects of medical treatment has nevertheless not yet been arrived at. In general the medical treatment of cholelithiasis rests substantially upon the basis of Naunyn's views. Naunyn, together with his pupils and numerous other observers, has recognised stasis of the bile as the essential for all calculus formation and has shown what an important rôle inflammation plays in gall-stone diseases. Since Naunyn, nearly all observers have accepted the view that bacterial infection of the stagnating bile is indispensable for the production of concretions. Nevertheless, as a result of the brilliant researches of Aschoff and Bacmeister, convincing proof has been given that simple biliary stasis without bacterial infection can lead to the formation of concretions, and that in many cases a non-inflammatory gall-stone condition precedes the inflammatory gall-stone disease.

Aschoff and Bacmeister have shown that the actual structure of concretions indicates different methods of origin. In numerous cases gall-stone disease is initiated by the formation of the "radiating cholesterol stone," which stands in a peculiar relation to all other concretions. The cholesterol of which the stone is composed is not produced by the epithelium of the mucous membrane of the gall-bladder, as was suggested by Naunyn, but originates from the bile itself, and is separated as an autochthonous decomposition product of the bile without infection when stasis of the bile occurs. The "non-inflammatory radiating cholesterol stone," which is almost always solitary and may remain for years in the gall-bladder without producing any irritation, can, however, lead to an inflammation of the gall-bladder and thus induce inflammatory gall-stone disease. The stones, which start upon the basis of an infection, are differentiated from the non-bacterially produced radiating cholesterol stone by their richness in calcium, which is for the most part supplied by the inflammatory exudate. The radiating cholesterol stone presents an entirely modified appearance in chronic inflammatory gall-stone conditions, since abundant calcareous layers become deposited upon the radiating stone. By this means the mixed stone is produced, having for its nucleus a distinct radiating cholesterol stone, with a covering of lime salts, which is more marked in proportion to the intensity of the secondary inflammation and the associated excess of lime salts in the bile. Besides these mixed stones, other cholesterol-calcium stones are formed as primary concretions and are characterised by great variety of form. As already mentioned, according to the researches of Aschoff and Bacmeister, inflammatory cholelithiasis is preceded in many instances by a primary non-inflammatory stage of stone formation. The inflammatory stage can, however, start primarily when infective agents gain access to the gall-bladder very soon after the origin of the stasis. In such cases a formation of inflammatory cholesterol-calcium stones occurs primarily, and one finds neither the solitary cholesterol stone nor the above-mentioned mixed stones.

The guiding principles in the treatment of cholelithiasis are derived from the well-established facts that stagnation of the bile is the fundamental condition for the production of concretions, and that in chronic inflammatory cholelithiasis infection plays the most significant rôle, infection in its turn being favoured by stasis of the bile.

Since the formation of stones is always a secondary phenomenon, it would be irrational to direct our treatment exclusively against the stones themselves, because, even after the expulsion of some of the stones, if the stasis and inflammation continue, stones still remaining behind may grow larger, and new stones may form. As a consequence, the conviction becomes more and more firmly established that the object of medical treatment consists not in the expulsion of the stones, but in the prevention of the formation of new stones by combating stasis and inflammation, and in bringing stones already present to rest, thus inducing a latency of the disease—which is in effect almost a recovery, since stones often remain for years as harmless foreign bodies as soon as the flow of bile becomes normal and the inflammatory process ceases.

It is not my intention to examine in detail all the questions that come into consideration in the treatment of cholelithiasis. I wish, however, to notice certain specially important points concerning which a consensus of opinion has not yet been arrived at, and, most important of all, to discuss a principle of treatment that has always played an important rôle in the treatment of cholelithiasis—viz., the principle of "cholagogue action."

At the time when the removal of the stones was regarded as the object most to be desired it was thought that the expulsion of the concretions would be most effectively assisted by means of agents promoting the flow of bile. But even though the paramount object of medical treatment is no longer considered to be the expulsion of the stones, the principle of cholagogue treatment has not diminished in importance, since it is often suggested that by this means biliary stasis may best be treated.

The numerous researches instituted to investigate the action of different substances upon the secretion of bile have afforded such contrary results that at the present time the greatest confusion prevails in regard to the whole subject. The reasons for this become clear as soon as it is realised that

these researches are subject to numerous sources of error which are in part unsurmountable, and further that individual workers have chosen varying methods of research, with the consequence that the results obtained are quite incapable of comparison. It is well known that these experiments are usually carried out on dogs in which a fistula of the gall-bladder has been made after ligature of the ductus choledochus, so that the bile secreted by the liver is conducted externally through the gall-bladder. Since the gall-bladder does not now serve as a reservoir for the bile, but is continually emptied, the outflowing bile must have an entirely different constitution from the normal; and since the bile flows without the normal pressure resistance, it follows that a factor is excluded which must certainly be of importance in the formation of bile in the liver.

Moreover, by many authors the fact has not been sufficiently recognised that certain constituents of bile, especially the bile salts, are re-absorbed in the intestines, and, as Stadelmann has shown, are again excreted with the bile up to the proportion of two-thirds, so that these substances move in a circulation between the liver and the intestine; consequently, when the bile is discharged through the fistula of the gall-bladder it gradually diminishes in solid constituents. To allow for this condition certain investigators have either permitted their experimental animals to lick the bile as it flows, or have given to them a definite quantity of bile. In this connexion, however, it has often been lost sight of that in these circumstances an uncontrolled factor is introduced, since the animals receive every day a bile of differing constitution. A further point is that frequently the output of bile has been studied only for a few hours, in spite of the fact that its secretion may vary very widely in the course of the day; and even in the relatively few experiments which have lasted as long as 24 hours the fact has not always been sufficiently taken into account that in different animals—indeed, even in one and the same animal—the quantity and composition of the bile vary within wide limits in spite of similar diet. But how often have far-reaching conclusions upon the action of this or that drug been deduced from small differences in the secretion of bile! Finally, we must emphasise the point that the diet has been handled by different investigators in very varying fashion, since the action of individual substances has been studied sometimes in conditions of hunger, sometimes on low diet, and sometimes with maximum amounts of food.

In this state of matters it is not surprising that researches upon the modification of the secretion of bile have led to such divergent conclusions. All that can be regarded as established is that the administration of bile itself increases the quantity of the bile secreted and increases the amount of water and solid constituents proportionally to the increased flow. Even in relation to salicylic acid, the cholagogue effect of which next to bile itself has been most frequently and constantly observed, there is as yet no complete agreement, some workers having found an increased output of bile of normal composition, while the majority have found increased secretion of bile with a diminution in the percentage of solids. In regard to all other drugs there exists such a maze of contradictions that I cannot here discuss them. The few researches carried out on men with gall-bladder fistulae have advanced our knowledge of the problem of cholagogue agencies even less than experiments on animals.

If now it be asked to what degree the particular means which induce increased secretion of bile may be of value in the treatment of cholelithiasis, it may be affirmed that the value of such agencies would be incontestable if the formation of bile were diminished in gall-stone disease. It is not known, however, whether the bile secretory function of the liver cells is damaged in cholelithiasis or in what direction it is altered. At all events, the principal point is, not that too little bile is formed, but that the bile which is formed stagnates, especially in the gall-bladder and secondarily in the bile-ducts, and consequently its overflow into the intestine is rendered more difficult. It is well known that the filling of the gall-bladder is dependent upon the tonus of the choledochoduodenal sphincter, that powerful constricting muscle in the pars intestinalis of the ductus choledochus. This sphincter is opened only at definite times, chiefly during digestion, and it opposes a powerful obstruction to the bile, so that this is forced to flow towards the place of less resistance—viz., through the cystic duct into the gall-bladder. At the beginning of digestion,

as soon as the sphincter is opened, the thickened bile from the gall-bladder, mixed with the bile now abundantly secreted by the liver, reaches the duodenum. Since the bile in cholelithiasis stagnates in the gall-bladder more than under normal conditions and becomes more viscid and thick, and therefore is hindered in its outflow during the periodic opening of the sphincter, it is above all things our object to promote its expulsion into the intestine. It has been widely accepted that this object can be achieved through an increased secretion of bile, because it is believed that through the increased pressure arising from the more abundant flow of bile, the bile is more easily driven out into the intestine. This sounds quite plausible, but it is nevertheless by no means established. If the sphincter muscle did not exist and the bile simply flowed out continuously, then, indeed, the stagnating bile could be forced more easily into the intestine by the increased pressure. But it is quite irrelevant to the function of the sphincter (which is of paramount importance for the whole question) whether the bile formation of the liver is increased; for the sphincter is opened only through reflex impulses originating in the intestine, principally when chyme arrives in the duodenum from the stomach. This sphincter opposes a resistance to the bile-stream corresponding to a pressure of about 700 mm. of water, while the normal secretion pressure in the bile ducts is equal only to about 200 mm. of water. Stadelmann considers it very doubtful whether cholagogue agents can increase the pressure in the bile ducts to such an extent that the resistance of the sphincter can be overcome. Other authors also regard the use of cholagogue agents in cholelithiasis as irrational, or at any rate as practically useless, and I associate myself with this view the more strongly since I am convinced that in certain stages of the disease these agents may induce actually dangerous consequences. For example, when in a case of chronic obstruction of the ductus choledochus so large a stone is fixed that the obstruction cannot be overcome, even by the maximum pressure of the bile, each increased production must lead to a greater congestion of the bile and to a greater loading of the blood with bile. In such cases it would be desirable actually to reduce the bile formation in the liver.

The rise of pressure produced by the increased secretion of bile may thus not be able to influence biliary stasis. It is, however, possible to produce a more easy outflow of bile into the intestine if we make the bile more *fluid*. It appears to be established that certain so-called cholagogues produce more fluid bile, and on this ground it cannot be denied that they may have a certain value in promoting the outflow of bile. But the only determining factor in their action is the thinning of the bile, and not the increased pressure produced by the augmented secretion of bile. This thinning of the bile after the administration of certain substances can be produced without increasing its quantity, indeed even with a reduction thereof, as Winogradow has clearly demonstrated. But if by some substances the thinning of the bile can be produced and its outflow into the intestine during the periodic opening of the sphincter be promoted, it is not at all necessary that increased secretion should play any part. The increased pressure thus produced if it occurs will have no detrimental effects so long as there is only stagnation of the bile. Increased production of bile can, however, become a danger when an impassable obstruction occludes the bile ducts, because then the pressure becomes considerably raised and the stasis is increased.

In my experience of all the substances recommended for this purpose I can attribute a genuine value to *salicylic acid* only. Salicylate of soda with extract of belladonna I have often found valuable in practice. Nevertheless, I do not at all believe that the salicylic acid exerts its effects on account of its cholagogue action, but am much more strongly of opinion that its chief influence is upon the inflammatory symptoms. Consequently I have seen the best results with salicylic acid in acute and chronic cholecystitis, especially with simultaneous rest in bed and the application of hot compresses. In such cases I give from two to four times a day a powder of sodium salicylate 0.5 grm (8 gr.), and extract. belladonnæ 0.01-0.02 grm. ($\frac{1}{3}$ - $\frac{1}{4}$ gr.), dissolved in warm water. With all the other so-called cholagogue agents, which are always being vaunted as curative agents for cholelithiasis, I have never obtained definite results. In my experience the value of the oil cure has not proved very great. The oil can be useful only for the simultaneous colitis or spastic constipation which not infrequently complicates cholelithiasis.

In this connexion I must refer to a drug which has long been prescribed, especially in England—viz., *calomel*. There can be no doubt that calomel does good service in many affections of the liver, and it is well known how usefully calomel influences so-called "biliousness." Several authors state that they have seen great benefit in cholelithiasis from small doses of calomel given for long periods. Personally I have used calomel for years according to the recommendation of Sacharjin in severe cases of biliary colic accompanied by constant pain and high fever. I give 0.06 grm. (1 gr.) every hour for the first three to five doses, according to the nature of the case, and afterwards every two hours until the first typical calomel stool appears. I have never exceeded eight doses—i.e., about 0.5 grm. (8 gr.) a day. Striking results are frequently obtained by this treatment, since the pains often cease at once, the fever gradually diminishes, and the whole severe symptom-complex completely disappears in a few days. How calomel acts in these cases, as also in other liver affections, has not as yet been explained in a satisfactory manner in spite of the numerous researches that have been carried out with it. The secretion of bile is somewhat diminished by calomel—a fact which also speaks against the cholagogue treatment of cholelithiasis, for calomel is more effective than all the cholagogues—and even the disinfectant action so often attributed to calomel is not confirmed by the recent researches of Knick and Pringsheim. Possibly, as Keay suggests, calomel, which expels abnormal products of digestion from the intestine, may also induce certain changes in their capacity for absorption. If the conveying of abnormal products of digestion to the liver leads to the secretion of an abnormal bile which irritates the mucous membrane of the gall-bladder and bile-ducts, calomel may thus lead to the formation of a purer, more healthy bile. By the flow of this fresh normal bile the biliary apparatus may be purified from the stagnant, thickened bile, and from inflammatory products, so that the stones come to rest.

I have already insisted on the importance of promoting the expulsion of the stagnant, thickened bile, and shown that this can be effected by making the bile more liquid. A thinning of the bile is without doubt produced, and in a less harmful fashion than by cholagogues, by drinking abundance of water, especially on an empty stomach. For this reason practically all physicians agree that abundance of fluid is very useful for patients with gall-stones. In my opinion, the water is best given on an empty stomach, and as hot as possible, for cold liquids should be strongly forbidden in cholelithiasis under all circumstances, as they frequently induce attacks of colic. I therefore recommend all these patients to drink in bed in the morning about an hour before breakfast one to two tumblers of hot water, in like manner a tumbler in the evening before going to bed, and smaller quantities frequently during the day. It is also very useful for the patients to take warm water at mealtimes. They easily become accustomed to this, and experience the less objection to the warm water the hotter they drink it. A dilution of the bile can also be effected through the rectal injection of water. The introduction of large quantities of water into the intestines has been recommended in cholelithiasis for about 30 years, and many authors have confirmed its useful action. For a long time in Carlsbad enemata of Carlsbad sprudel cooled down from 40 to 50° C. have been employed, the patient retaining them as long as possible up to an hour. These injections prove especially useful in chronic jaundice (obstruction of the common duct), and are to be recommended also in such cases when the administration of large quantities of water by the mouth does not appear advisable on account of a coexisting atony or dilatation of the stomach. They are, moreover, of special value where catarrh of the intestine is present at the same time, this condition being, as is well known, a relatively frequent accompaniment of cholelithiasis.

Besides the dilution of the bile, there are yet other factors that promote the expulsion of the bile from the gall-bladder and thus lessen stasis. Here again the function of the choledochoduodenal sphincter comes into consideration, its periodic opening being the essential preliminary to the entry of bile into the intestine. The more frequently the tone of this muscle relaxes the more often the outflow of bile is rendered possible. According to researches into the nature of this mechanism (chiefly carried out in Pawlow's institute) the sphincter opens during digestion every time the outflow of the food from the stomach into the duodenum occurs. When the stomach is empty, or after it has discharged its contents

completely, the outflow of the bile into the intestine ceases. On this account it is advisable to allow as short pauses as possible in the passage of the chyme into the duodenum. In other words, we must give patients with gall-stones food as often as possible, a principle which was recommended by Frerichs and emphasised by Naunyn. Unfortunately, this instruction is often misinterpreted, because in the endeavour to stimulate bile secretion especially heavy meals have been recommended. A heavy meal certainly stimulates bile production much more powerfully than any drugs; but as I must again affirm, this is not at all the main object of our treatment. This condition illustrates most distinctly the real danger of marked cholagogue action. Nothing is so likely to induce biliary colic as an over-filling of the stomach, since a stone which has been quiet for months may be made to move by a single heavy meal. *The ordering of frequent but small meals forms the first principle in the dietetic treatment of patients with gall-stones.* The diet should be divided into at least five meals daily.

The patients must absolutely avoid all excess in eating, but this instruction must not be so interpreted as to lead to under-nutrition. All foods difficult of digestion which make great demands upon the digestive organs, all foods which are easily decomposed and lead to fermentation, must be strictly forbidden, because too great stimulation and overwork of the stomach can produce reflex contractions of the gall-bladder, and thus induce painful sensations or attacks of colic, and because both the stomach and intestine are often affected in association with cholelithiasis. In order to lessen the work of the stomach the patient should take food minced or in the form of purée. Very cold foods are as much to be avoided as cold drinks. In individual cases the directions must be adapted to the existing conditions of the stomach and intestines. This summarises the whole question of dietetic treatment of cholelithiasis. There is no special gall-stone diet, and a recommendation or an exclusion of certain food-stuffs, which was frequently done in older schemes of diet, is absolutely unjustified. In accordance with the principles just enunciated the diet should be as varied as possible, and only special complications on the part of the stomach and intestines, or accompanying diseases like gout and obesity, require the protein, fat, and carbohydrate to be specially regulated. By following the diet recommended, acute catarrh of the stomach or duodenum—conditions which may have the most severe consequences for patients with gall-stones, since they may spread to the bile-ducts and promote the entrance of infective organisms into those ducts—may best be avoided.

If we return once more to the chief indication for our therapeutic considerations—viz., the stagnation of the bile—we come to the last factors upon which the outflow of bile into the intestine depends. These are the intestinal movements, the action of the abdominal walls, and the pressure of the diaphragm upon the liver during inspiration. In the first place, we must mention the regular normal action of intestinal peristalsis, which is transferred to the muscular agencies of the bile-ducts and so promotes the outflow of bile. We must not go too far, however, in the treatment of sluggishness of the bowels, since too strong stimulation of peristalsis may give rise to movements of the stones and start colic. Therefore, although it is one of the most important tasks in cholelithiasis to ensure regular defæcation, especially in view of the frequency of constipation in this condition, yet the administration of drastic purgatives must be avoided, the more so because every powerful irritation of the intestine is especially dangerous in the enteritic processes which are not infrequently present.

Lastly, all those factors must be mentioned which exert an influence on the respiratory action of the diaphragm, and through this on the outflow of bile, such as the loosening of the clothes after meals, the prohibition of tight corsets, matters into which I need not further enter. From the same point of view physical exercises have been recommended, which certainly prevent stagnation of the bile.

The question of bodily movements for a patient with gall-stones is one of the greatest importance. It was a notable service of Naunyn's, and placed the subject upon the right foundation, when he ordered treatment by rest for cases with acute and chronic irritative phenomena.

Rest should be absolutely insisted upon in the first attack of biliary colic, and I regard it as one of the most important recommendations to keep the patient in bed for several days after each attack, even when it passes off quickly and gives

rise to no further discomfort. The effects of rest are demonstrated in the most striking manner in cases of pronounced cholecystitis and in all chronic inflammatory irritations in the bile-ducts. In all severe cases the patient must remain in bed and should not be allowed up until all inflammatory manifestations have passed off and until no tenderness on pressure over the gall-bladder remains, a period which may extend from days to weeks according to the severity of the case. It is quite otherwise with those cases which remain free from colic for long periods and present no inflammatory manifestation, and in which we can find on examination no tenderness on pressure over the region of the gall-bladder. Physical exercises here not only are indicated, but constitute one of the most important factors in treatment. If in such patients the bodily movements are restricted, one of the most effective measures against biliary stasis and also against the entrance of infective agents into the bile-ducts is discarded, and those inflammatory conditions for which rest becomes a necessity are thus promoted.

Among bodily movements I lay great stress upon deep breathing exercises, and regard methodical breathing as very valuable. In like manner, also, certain gymnastic exercises carried out in careful fashion are especially to be recommended. All brisk movements, however, such as severe shaking of the body and the lifting of heavy objects, should be avoided. Moreover, I regard massage of the liver and gall-bladder as deleterious.

The therapeutic principles just outlined should be adhered to even during a cure at Carlsbad. The well-known results of Carlsbad cures in cholelithiasis are by no means to be explained by any cholagogue action of the waters. In my opinion, the Carlsbad waters no more possess any cholagogue action than they do a stone-expelling effect. The modes of action of the Carlsbad waters in cholelithiasis are manifold. Above all, experience teaches that they dilute the bile to a greater extent than ordinary water, and therefore promote the outflow of bile in an effective manner. It must also be borne in mind that the Carlsbad waters favourably influence the circulatory conditions in the liver and alimentary canal and the catarrhal processes in the intestine, liver, and gall-bladder. The mild stimulation of the intestinal peristalsis, the purification of the intestine from injurious products of digestion and from bacteria, and the antispasmodic action of the hot springs comprise the other principal factors which are concerned in the production of their beneficial actions, of which sometimes one, sometimes another, becomes more prominent. The total result of these effects is in the end to restore the normal flow of bile and to remove inflammatory processes; by these means are fulfilled the postulates which I have enunciated above as the object of medical treatment.

Naturally the action of the waters is shown in varying fashion according to the relations of the stones. In uncomplicated cholelithiasis, in which the stones have not yet left the gall-bladder, they come to rest through the cessation of the biliary stasis and the removal of the catarrhal changes in the mucous membrane of the gall-bladder. With patients in whom stones have already left the gall-bladder and are arrested in the bile-ducts the effects of the Carlsbad waters are not to be explained in such a simple manner. If we take, for example, a case in which a stone has entered the cystic duct, and in which an inflammatory swelling of the wall of the duct exists, then the stone becomes loosened and more easily moveable through the gradually diminishing swelling of the mucous membrane. By this means under certain circumstances an attack of biliary colic may be induced. The stone may become moved back into the gall-bladder so that the condition of latency may again be produced, or, if the concretion is small, it may be passed into the intestine. This example demonstrates that in the course of the beneficial effects of the Carlsbad waters upon the inflammatory process an attack of colic may sometimes be started, although the Carlsbad waters do not possess any real power of expelling stones, and further, that such attacks of colic by no means prejudice the good result of the cure but even render permanent benefit possible. In my opinion the fact that many patients who during the cure have attacks of colic often remain free from trouble for months or years is thus to be explained. This explanation is supported by the fact that in Carlsbad the attacks of colic often originate without marked inflammatory symptoms and are associated with relatively little pain, so that it is but seldom necessary to employ morphia.

Carlsbad.