3. In cases of considerable effusion an obvious indication is to relieve the brain from the weight and from the pressure of the fluid. The evacuation is facilitated by the introduction of aseptic air. In case 1 this treatment has proved to be of decided advantage. By a timely repetition of the operation a hydrocephalic infant might be enabled to carry the weight of the head, and if the treatment were begun sufficiently early, permanent damage to the brain tissue might be averted and a normal development might perhaps ensue.

3. In large heads, while hydrocephalus persists, a considerable splashing sound is readily obtained. There is obvious risk in eliciting this sound by forcible succussion, and for the same reason any abrupt movement of the head should be avoided.

Discussion.—See PEDIATRICS for Sept. 15th, 1901.

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TREATMENT OF TINEA.

In tinea involving the scalp in children the following is recommended as a hair wash:

B

- Tinct. cantharidis .......... ʒiss
- Tinct. capsici ............. ʒiss
- Olei ricini .................. ʒii
- Eau de Cologne, q.s.ad .... ʒiii

M. Sig.—Use as a hair wash.

Or:

B

- Sodii boratis ............... gr.x1
- Spts. camphoræ .......... ʒi
- Glycerini .................. ʒii
- Aq. aurantii, q.s.ad .... ʒiii

M. Sig.—Use as a wash to the scalp.—Jour. A.M.A.
RESULTS OF TENDON GRAFTING IN INFANTILE AND SPASTIC PARALYSIS.

By A. H. TubbY, M.S., F.R.C.S.,
London,
Surgeon to the Westminster, Evelina and National Orthopedic Hospitals.

At the meeting of this Association (1898) our President, Mr. Eve, read a paper on the subject of tendon grafting for infantile paralysis, and gave details of four cases in which he had carried out the procedure. In that paper he laid down certain rules, which further experience has shown to be of the greatest value.

He remarked that some one group of muscles might at least be possessed of a fair amount of power in order that the requisite force may be obtained; and cases of flail-like joint, in which all the muscles are paralyzed, are only suitable for arthrodesis. In selecting the muscle for grafting, that one should be chosen whose action is most nearly allied to that of the paralyzed muscle, or group; not only because such a muscle is nearest, but also because restoration of voluntary function is more readily obtained.

Again, before the operation we are considering is carried out, any faulty position of the foot, such as talipes cavus, will require attention.

Mr. Eve expressed the opinion that the improvement effected by this operation was brought about in a variety of ways. Where the action of the graft or functioning muscle is nearly allied to that of the paralyzed one which it reinforces, the patient is soon able to accomplish voluntarily the new movement. Other factors also come into play in furnishing the patient with a firm base of support, adjusted to the normal position; for the graft, or functioning tendon, acts as a supporting band applied, where it is most required, to the ankle and foot, and a selection of one or more of the contracted antagonists for reinforcing the paralyzed muscle while removing useless force from the antagonist, confers power on the paralyzed muscles.

The further objects of the operation are to avoid, as far as possible, the use of cumbersome and expensive apparatus,
and to increase the nutrition and growth of the affected part.
I have noted that the circulation improves and the warmth of
the foot increases after the operation and in the winter chil-
blains do not often occur.

There can be no doubt that tendon grafting as an opera-
tion has a distinct future before it. The method of treating
paralytic talipes which has been most usually carried out has
been to disregard the existence of the paralyzed muscles and
by tenotomy to lengthen and therefore to weaken the muscles
retaining their action; and then having by this means brought
the foot into position, to keep it passively in one position.
Tendon grafting aims at distributing what power is left to the
muscles around the joints and then by careful education and
training of such healthy muscles in their new attachments, to
bring them into a condition of exaggerated size, action and
nutrition.

During the past three to four years I have done eleven
cases of tendon grafting on the feet for paralytic talipes, the
results of which I am able to report. Of these, four have been
done for calcaneo-valgus; two for talipes calcaneus; one for
equino-valgus; three for equino-varus, and one for calcaneo-
varus. In addition, four cases of spastic paralysis, affecting
the forearm and hand, have been operated upon by the method
which I described in the British Medical Journal in 1898,
which consists in the transplantation of the tendon of the
pronator radii teres, with section of the flexor tendons of the
wrist.

Taking the group of four cases, namely, calcaneo-valgus,
a condition due to paralysis of the calf muscles and of the
tibialis anticus, I find that the results have been good so far as
the restoration of function is concerned in the paralyzed parts,
and I briefly detail the cases and show some illustrations of
the cases before and after operation and their present con-
dition.

CASES OF TALIPES CALCANEO-VALGUS TREATED BY TENDON
GRAFTING.

CASE 1.—I. F., aged 8 years, was admitted to Westminster
Hospital on October 19, 1900, suffering from paralytic talipes
calcaneo-valgus of the left foot, which had come on after a
paralytic attack when she was 2 years of age. She had had
no treatment for the condition until she came under my care.
When the limb was passively raised from the ground the front part of the foot hung helplessly pointed and everted, the sole was deeply concave, the heel was prominent and had the typical globular appearance of these cases, and the plantar fascia was contracted. The latter was divided and the sole of the foot unfolded, a process which took about four weeks. The muscles having been carefully tested, it was found that there was some power left in the tibialis posticus and normal power in the peroneus longus. It was therefore decided to graft the peroneus longus and the tibialis posticus into the tendo Achillis, which we accordingly done. The result is well seen in the illustration; the child can voluntarily raise the heel from the ground; the foot is of comely shape and she progresses with ease.

Case 2.—A second case of calcaneo-valgus was that of A. S., aged 7 years, who was admitted to the National Orthopedic Hospital on June 23, 1898. It was noted that the peronei acted well but the calf muscles failed to raise the heel at all. On July 1st the peronei were grafted into the tendo Achillis behind the external malleolus. On August 10th it was noted that there was good power of voluntary extension of the foot and when it was made the peronei could be felt to harden and the lower portion of the tendo Achillis to become tense; there was no valgus, and the foot was in excellent position; he could lift the heel off the ground and raise himself on his toes; for a time he wore a light steel apparatus so as to control the valgus, but this has since been discarded and the improvement maintained.

Case 3.—W. C., aged 3 years, admitted to the National Orthopedic Hospital on September 19, 1899, suffering from infantile paralysis of the left leg. When about a year old and after he had walked he had a fit. It was noticed on admission that the muscles of the left leg were generally wasted and the plantar flexors and invertors were paralyzed, while the dorsi-flexors and evertors retained a moderate degree of strength. The right foot was not much affected but the sole of the foot was somewhat more hollow than natural and the balls of the toes were dropped. On October 28, 1899, the left peroneus longus was grafted into the tendo Achillis and the patient was discharged from the hospital on February 22, 1900. He was
able to raise himself on his toes, but some talipes valgus persisted, which is controlled by a valgus pad and T-strap, and this is his present condition.

Fig. 1.—To illustrate Case I, showing a condition of paralytic talipes calcaneo-valgus, before treatment, in a girl aged 8 years. The foot and leg are hanging over the edge of a table.

Fig. 4.—To illustrate the condition of talipes calcaneo-valgus in Case IV, before treatment.

Fig. 2.—The same foot, before treatment, as in Fig. 1, and resting on the ground. The globular heel and excessive concavity of the sole of the foot are seen.
Case 4.—F. L., aged 4 years, was admitted to the National Orthopedic Hospital on February 20, 1900. The history was that a year before admission, when he woke up one morning, it was found that he could not walk although he had gone to bed well the night before. There was much wasting of the left leg, and the knee-jerk on the left side was not obtainable. The foot was everted, and there was good power in the peronei and the extensor communis digitorum. When the foot was brought to the middle line he was able to invert it slightly by the action of the tibialis posticus, although the tibialis anticus appeared to be paralyzed. The limb was half an inch short. On February 22d a transverse incision was made across the front of the ankle-joint, the extensor communis tendon found and split longitudinally and its outer half having been divided the proximal portion of this section was grafted on to the tibialis anticus. It was not deemed advisable to graft the peronei on to the tendo Achillis as the amount of calcaneus was not great. The effect of the operation was that he could raise the inner border of the foot and much of the valgus was overcome. When seen on July 18th of this year the result was very good indeed and fully justified the operation. The calcaneus had disappeared as the result of persistent massage and faradism of the calf muscles.

Fig. 3.—To illustrate the appearance of the foot in Case 1, nine months after the operation of grafting the peroneus longus and flexor longus pollicis into the tendo Achillis. The shape of the foot is good, and it will be noted that the heel can be lifted well off the ground.
Of these four cases of tendon transplantation the result is now seen to be good in three and fair in one. It is comparatively easy to overcome the talipes calcaneus, but unless special care be taken there is a residuum of valgus. This is often due to excessive action either of the peroneus brevis or of the outer part of the extensor communis digitorum, which, a few months after the operation, may be both seen and felt to be tense. I would therefore recommend that not only should the peroneus longus be inserted into the tendo Achillis, but the peroneus brevis should be divided or half an inch excised from it. If it be moderately tense at the same or a subsequent sitting the outer half of the extensor communis digitorum should be grafted on to the tibialis anticus. By doing so the natural equilibrium of muscles around the ankle-joint is more nearly imitated.

**CASES OF TALIPES CALCANEUS TREATED BY TENDON GRAFTING.**

Pure talipes calcaneus is fortunately of rare occurrence, especially after infantile paralysis. But it is far more commonly seen as the result of dividing a contracted tendo Achillis for equinus and not maintaining proper control of the tendon after the operation. A case in point is the following:

**Case 5.**—R. B., aged 8, was admitted to Westminster Hospital on May 9, 1898. When the foot was allowed to hang, it presented the appearance of a Chinese lady's foot. The dorsum was extremely convex, the toes curved over, the sole of the foot exceedingly hollow and the heel was dropped, globular and elongated. At the back of each ankle was an elongated scar, where attempts had evidently been made to shorten the tendo Achillis after the faulty operation for equinus. The case did not present a promising appearance, and some time was consumed in unfolding the soles of the feet. In July, 1898, a longitudinal incision of about 4 inches in length was made at the back of each ankle, the peroneus longus tendon found in each case and divided just below the external malleolus and inserted into the posterior aspect of the os calcis. It was very difficult to identify the remains of the tendo Achillis; they were thin and membranous, having the appearance of fasciae rather than of tendons. The wounds healed kindly, and the child was discharged from the hospital in October, 1898, being able to raise herself on her toes, although some pes cavus still existed, and the feet were not of a good
shape. The calcaneus was markedly diminished and has remained so. But considerable difficulty has occurred with regard to the persistent tendency to the recurrence of the cavus.

Case 6.—T. V., aged 6, was admitted to the Evelina Hospital on August 25, 1898, with a marked degree of talipes calcaneus of the right foot, the result of infantile paralysis four years previously. The invertors and evertors of the foot were of equal strength and dorsiflexion was good, so that a longitudinal incision was made over the middle of the tendo Achillis and about 5 inches in length. By dissecting back the subcutaneous tissue well the tendons posterior to both malleoli were exposed and the peroneus longus and the flexor longus pollicis* were in good equilibrium, and it could be very readily pointed.

Fig. 5.—Inside and outside views of the same foot as in Fig. 4, and of Case iv, after treatment by muscle grafting.

In such a case as the last named, and wherever the condition of the muscles permits it, it is always better not to be

* The flexor longus pollicis is a good muscle to use for this purpose when it is not paralyzed, for it contributes but slightly to the support of the arch of the foot, and the great toe has a short flexor in addition.
merely with inserting a tendon from only the external or internal aspects of the ankle, but it is better if possible to reinforce the tendo Achillis by tendons taken from either side. Because, if for example the peroneus longus only be taken, and it be inserted low down into the tendo Achillis it will by the direction of the fibers be likely to produce valgus later, although rolling the calcaneus; that is to say, the balance on either side of the middle line should be preserved as far as possible.

Fig. 6.—Views from behind of method of inserting a tendon into the tendo Achillis. A, Peroneus longus, to be inserted into tendo Achillis, B, through the longitudinal incision in the latter at c. The ends of the tendon A are seen split. They are then passed through c from before backwards, and firmly stitched down to the posterior surface at d and e.

A CASE OF EQUINO-VARUS TREATED BY TENDON GRAFTING.

Case 7.—C. L., aged 6½ years, was admitted to the National Orthopedic Hospital on August 29, 1898, suffering from infantile paralysis of the left foot, which was in a position of equino-valgus. The tibialis anticus and posticus were paralyzed, while the extensor proprius pollicis and inner portion of the extensor communis digitorum were affected to a less degree, but the outer portion of the latter seemed to act well, and so, too, did the peronei. The tendo Achillis was somewhat tight and the angle of dorsiflexion was just under 90 degrees. The sole of the foot was more concave than usual. On October 12th, some weeks after section of the plantar fascia, an incision 5 inches long was made along the inner and poste-
rior aspect of the leg and the tendo Achillis was split along its whole length; the inner half was severed below the ankle, and brought round and stitched to the tibialis posticus. The remainder of the tendo Achillis was divided as well as the peronei. All went well, and when the boy left the hospital in

Fig. 7.—To illustrate the method of transforming the pronator radii teres into a supinator. * a. Pronator radii teres, in 1 passing in its natural course to its insertion on the radius. In 2 the tendon has been detached and has been passed behind the radius to its outer side. c is the opening in the interosseous membrane through which the tendon is passed, and it is reinserted at d. At e the flexor carpi radialis has been divided. 3 is a posterior view of 2, but in 3 the pronator radii teres is drawn too low down on the radius.
January, 1899, his foot was in capital position, but since then slight relapse has taken place and there is some valgus present. It is a matter for regret that a portion of the peronei tendons was not extsected or it would probably have been better to carry round the peroneus longus tendon into the flexor communis digitorum, as well as inserting the inner half of the tendo Achillis into the tibialis posticus.

CASES OF EQUINO-VARUS TREATED BY TENDON GRAFTING.

Case 8.—C. C., aged 2½ years, was admitted to the Evelina Hospital on July 6, 1898. He appears to have had an attack of infantile paralysis at the age of 9 months. He was a healthy-looking boy, but the right leg was partially paralyzed; this was especially so with the extensors of the toes. The foot was pointed and inverted, resting on the external malleolus. On July 22 a longitudinal incision about 3 to 4 inches in length was made at the posterior and outer aspect of the leg and the tendo Achillis and peroneus longus tendon exposed. The tendo Achillis was then split longitudinally for its whole length, and the gastrocnemius as far as the junction of its two heads. The outer part of the tendo Achillis was then severed transversely about an inch and a half above the ankle, and so, too, was the peroneus longus. The proximal part of the tendo Achillis and the distal part of the peroneus longus were then firmly quilted together; the remaining inner portion of the tendo Achillis was then severed so as to correct the equinus. For six weeks after the healing of the wound massage and faradism were applied; it was evident that the everting movement of the foot had been regained. The present condition is that the boy is able to walk about comfortably without any instrumental assistance, the only drawback being that the leg is 1 inch shorter than its fellow.

Case 9.—A. R. was admitted to the Evelina Hospital on January 5, 1899, suffering from paralytic talipes equino-varus of the left foot with paralysis of the peronei and partial paralysis of the dorsiflexors of the foot. The same procedure was adopted as in the previous case, but the tendo Achillis was only split for a short distance, the gastrocnemius not being divided longitudinally. The outer portion of the tendo Achillis was inserted into both the peroneus longus and brevis, while the inner part was divided transversely. The result is not so
good as in the previous case, owing doubtless to the fact that the outer strip of the tendo Achillis was not detached sufficiently from the main body of the tendon. In these cases it is

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Fig. 8.—To show method of reinserting the pronator radii teres tendon into the radius, after the tendon has been passed behind the radius. A, A, section of radius. B, hole drilled through the bone from before backwards. C, tendon of pronator radii teres. D and E, ends of silk thread passed through detached tendon. F, needle threaded on D and passing through the hole B in the radius of the second figure, and through the tendon of the pronator radii teres at G in the third figure. G, position where the free end of the thread, D, is passed through the tendon as it lies behind the radius. H, spot where the thread D is finally knotted to E, and the tendon is bound down to the roughened outer surface of the radius at its new attachment.
essential to fully detach the outer belly of the gastrocnemius as well and so provide an entirely separate muscle.

Case 10.—D. O'G., aged 4½ years, was seen on December 6, 1898, suffering with infantile paralysis affecting the left leg. The foot was in a position of equino-varus and the muscles affected were the same as in the preceding case. The same procedure was carried out but the outer portion of the gastrocnemius and the outer portion of the tendo Achillis were freely detached by a longitudinal incision. For two years the foot remained in good position but the extensor communis digitorum recovered its power almost completely, so that the two outer tendons became tense and the foot acquired some valgus which will have to be corrected by section of the affected tendons. It must be remembered that long after an attack of paralysis the affected muscles continue to recover and may therefore upset the balance which has been obtained previously by tendon grafting. Particularly so is this the case with the extensor communis digitorum.

Tendon grafting for equino-varus has not been so satisfactory in my hands as for other conditions. It is possible that the outer half of the gastrocnemius and tendo Achillis is too powerful for conversion into an evvertor of the foot, and it would doubtless be wiser to use either the flexor longus pollicis or the flexor longus digitorum, and pass either or both of them beneath the tendo Achillis into the peronei.

A CASE OF CALCANEO-VARUS TREATED BY TENDON GRAFTING.

Case 11.—W. H., aged 3, was admitted to the National Orthopedic Hospital in May, 1899, with some degree of calcaneus and of varus, the latter being mainly due to contraction of the plantar fascia. This was readily removed, and the calcaneus remained to be dealt with. The peroneus longus and flexor longus pollicis were grafted into the tendo Achillis and the result is very good.

Certain points in procedure may be alluded to; the first requisite is absolute asepsis, and the next point is the suturing material for the tendons. Catgut I have never tried, being deterred from doing so by the accounts of suppuration I have read of following its use, and it further seems to me that it is likely to become softened and therefore useless before the grafted tendons have become firmly fixed. I have used kan-
garoo tendon in thin strips, but the latter mentioned objection applies to this material also. The best substance I have found to be fine silk. This should be boiled once for half an hour, and then placed for seven days in a solution of 1 in 1,000 bine.

iodide of mercury.

Where the tendon to be reinforced is of sufficient size it should be split longitudinally, the end of the reinforcing tendon brought down through the slit and firmly sutured into position. Another point of importance is that the foot should be held in the position it is desired to obtain while the tendons are being grafted, and when they have been sutured the reinforcing tendons should be felt to be quite tense. There are many other methods of grafting tendons but I know of none so secure as that I have mentioned. It is well to keep the foot at rest in the corrected position at least for six weeks after the operation to allow of firm union taking place, and every effort should be made to straighten the reinforcing muscle by massage and faradism.

It is not advisable to allow the patient in all cases to walk about with the foot quite free from support or assistance, at any rate for a time after the operation; thus in calcaneus a toe-depressing spring is useful for a time. In paralytic valgus the foot should have a thickening along its inner border and in varus along its outer border.

TENDON GRAFTING FOR SPASTIC PARALYSIS.

While in paralytic affections we can arrive at a moderate estimate of the degree of strength and of weakness of the various muscles, in spastic affections the problem is more complicated, because such muscles are subject often to both tonic and clonic spasm dependent upon varying degrees of irritability of the cerebral centers; but certain cases of infantile spastic paralysis and, to a less degree, of cerebral diplegia, exhibit after a time fixed types of deformity arising from weakening of certain muscles with both contraction and contracture of their opponents. Such a fairly typical deformity is seen in cases of this nature in the upper extremity, a deformity which often renders useless the affected limb. I allude to the spastic contraction of elbow, wrist and fingers, with pronation of the forearm. If this condition has existed for some time there are two factors to be taken into consideration in applying any remedial measure. These are the (a) contraction of the mus-
cles, and (b) of the ligaments. By the method which has been practiced by me, not only can the contraction of the muscles be overcome but power which, under the circumstances of the disease, is viciously directed, can be transferred in such a way as to make it an agent for useful motion. The contraction of the ligaments can subsequently be overcome by passive movements, once the muscular contraction and contracture have been remedied.

If we look at limbs affected in the way which has been mentioned, we shall note this point. The muscles which arise from the internal condyle and are mostly affected are partially flexors of the elbow, almost entirely pronators of the forearm and flexors of the wrist and fingers; therefore if they can be attacked the contractions are relieved and some of their excessive power is transferred, especially from pronation to supination. The operation which has been practised by me has been described in the British Medical Journal of 1898 and the procedure is there figured. The object of the operation is to transform the pronating power of the pronator radii teres into a supinating power, and the flexor carpi radialis may be treated in the same way, although, as a rule, simple division of it suffices. Briefly, the operation on the pronator radii teres is as follows:

An incision is made with its center a little above the middle of the forearm, as for ligature of middle of the radial artery. The inner margin of the supinator longus is defined, the radial artery and nerve isolated and pulled to one side and the tendon of the pronator radii teres is seen beneath. It is easily recognized among other tendons by the direction of its fibers, and as a rule, is broad and flat. It is now detached from the radius together with its periosteum, and the muscle itself is separated for about an inch and a half from its neighbors. The next step is to make an opening through the interosseous membrane as near to the radius as possible so as to avoid the anterior interosseous artery and nerve. The best method is to pass an aneurysm needle around the radius and as close to it as possible; if necessary, peeling off some of the periosteum on its posterior and outer aspects. The tendon is then drawn through the aperture and behind the radius to its outer side; but as the muscle is often a short one and the distance the transplanted tendon has to travel to its new insertion is greater than to its normal insertion, the opening in the interosseous
membrane must be at a higher level on the forearm than that to which the usual course of the muscle corresponds. The next difficulty is to attach the tendon in its new position. The periosteum is roughened on the other surface of the radius at a point half an inch to an inch above the normal insertion of the pronator. A silk ligature with double end is then sewn on to the end of the tendon. A hole is drilled through the radius from before backwards, one end of the silk ligature is threaded with the needle, and the tendon of the pronator having been drawn around behind the radius, the needle is passed around the outer nose of the radius and then through the hole in the radius from before backwards and again through the tendon as it passes behind the radius and the ends of the silk ligature knotted. By such means the tendon is firmly fixed in its new position.

The flexor carpi radialis may either be divided by a transverse incision at the wrist joint, or it may be carried down through the interosseous membrane and fixed to the back of the radius in the same way as the pronator. For the flexion of the wrist and fingers it is sufficient to make an open transverse incision across the front of the wrist, isolate the median nerve and then divide the flexor tendons until the fingers can be straightened. By putting the hand up again in the faulty position leaving it there for ten days and then gradually putting it into the position midway between flexion and extension the required length of union in the flexor tendons can be accurately adjusted.

In a private case, that of D. R., a boy aged 6, upon which I operated in March, 1898, I obtained by this method a most excellent result, which has since persisted. The arm was previously practically useless for most purposes, but the boy can now use it for everything, even to the extent of writing and for such fine movements as picking up a pin.

In another case, a child aged 3, the subject of severe spastic paralysis, in whom the identical operation was performed two years ago, the process of recovery has been much slower, due partly to the resistance of the ligaments, and the case has been partially successful.

In a third case, a boy in Westminster Hospital, who was operated upon four months ago, the result so far is extremely gratifying, and the same remark may be made on a fourth case, in an adult, aged 22.
After the operation great persistence is necessary, both in massage and in passive movements, and the patient should be encouraged to use the arm. In children I find it very necessary to tie up the sound arm so as to ensure the use of the affected arm. There are doubtless improvements to be made in the operation, but I feel sure that the conception promises well.

So, to sum up briefly, of eleven cases of tendon grafting for paralytic talipes, six have shown good results and five fair results; meaning by "good" where the results aimed at had been fully attained and the improvement permanent, and by "fair" where a partial improvement has been secured. In no case has failure resulted. The results of the four operations in the forearm for spastic trouble have been good in three and partial in one.

Tendon grafting is an operation with a future before it, and it has great possibilities, but it must not be employed indiscriminately. It is useless in cases of flail-like joints, where all the muscles are badly affected and it should not be employed in slight cases of paralytic valgus or varus or in slight equinus, the last being easily remedied by section of the tendo Achillis. It is not an operation for the display of anatomical knowledge nor of mechanical skill in operating but one requiring the nicest care in the selection of cases and of the muscles to be employed and careful watching of the results of the operation for several years afterwards.

VISCOGEN, A NEW MILK ADULTERANT.

Housekeepers and pure-food commissioners have a new foe to fight. It is viscogen as a milk adulterant. It has been found by inspectors of the dairy department in Minnesota, and so far as known, its use is yet confined to that state. When its properties become generally known, however, it may confidently be looked for elsewhere. It is a syrup composed of sugar, lime and water, about the color of water, and is used chiefly to make the milk appear richer than it really is. When viscogen is placed in milk or cream the lactic acid turns the lime in the fluid into a white, thick substance, which, assimilating with the milk, gives it an appearance and taste of great richness. It is possible through its use to palm off upon customers milk and cream which are far below the standard.—Medical News.