These results would appear to throw doubt not only on the efficiency of sulphuric acid as a preservative for ascorbic acid but also on the nature of the reducing substance in the urine as measured by these tests. In any case an explanation is obviously required to account for the fact that ascorbic acid in the presence of urine and sulphuric acid is destroyed, while the reducing substance in urine, as measured by these tests and presumed to be ascorbic acid, is preserved by sulphuric acid of the same strength. Incidentally it may be pointed out that the loss of reducing substance in lemon juice when kept for twenty-four hours in 1 per cent. sulphuric acid is 100 per cent.

Table showing Loss of Reducing Substance in Tests with Sulphuric and Acetic Acids

	Loss of Reducing Substance	
	First Five Minutes	Subsequent 24 Hours
Ascorbic acid in water	% 10	% 100
" " 1% sulphuric acid	20	100
" " 5% acetic acid	5	29
Reducing substance in urine		31
" " " +1% sulphuric acid ..		16
" " " +5% acetic acid ..		19
Ascorbic acid and tested urine	2	45
" " " " +sulphuric acid ..	16	28
" " " " +acetic acid	1	22
Ascorbic acid and non-reducing urine		100
" " " " +sulphuric acid		89
" " " " +acetic acid ..		31

A Possible Difficulty due to Catalysis

It was suggested to us that a possible difficulty in this work is due to catalysis of the oxidation of ascorbic acid by traces of copper present either (a) in ordinary distilled water or (b) in the sulphuric acid. Stotz *et al.* (1937) also state that the sensitivity of ascorbic acid to aerobic oxidation when copper is present as a catalyst is perhaps its most striking characteristic *in vitro*. Lyman, Schultze, and King (1937) point out that the instability of ascorbic acid in weakly acid solutions is due to the copper content of the solution, and that by its strict elimination ascorbic acid solutions are stable below a pH of 7.6. These authors used metaphosphoric acid, which inhibits the copper-catalysed oxidation of ascorbic acid by decreasing the amount of copper effective in the catalysis.

However, if the copper is present in the sulphuric acid the question still remains as to why there is a difference in the rate of destruction of the reducing substance in fresh urine in the presence of sulphuric acid (? + copper) and the rate of destruction of ascorbic acid which has been added to fresh urine in the presence of the same reagent. It also fails to account for the fact that there is an immediate (five minutes) loss of ascorbic acid in fresh urine with sulphuric acid (? + copper) of about 16 per cent., while the loss in the same time with acetic acid is only 1 per cent. (The catalysis should be inhibited by fresh urine.) The only distilled water employed in these two tests is that used to dissolve the dye, and this would be present equally in all these tests. With regard

to the occurrence of copper in the distilled water used in the other tests, if it is present it would appear to make the test unreliable for clinical purposes—at any rate, where sulphuric acid is used.

Van Eekelen (1936) has pointed out that ergothioneine and thiosulphates both reduce 2:6-dichlorophenolindophenol and that these substances must be removed by precipitation with mercuric acetate. In view of the fact that even with acetic acid there is a destruction of ascorbic acid on keeping, it is quite obvious that the results obtained will be of very doubtful value, unless the titration is carried out immediately after voiding. Although to do this may appear clinically tedious, it is scientifically sound, for examination of twenty-four hours' urine is necessary.

Summary

Sulphuric acid, which was still being used to "preserve" ascorbic acid in twenty-four-hour specimens of urine at the time of writing, has been shown to destroy ascorbic acid even when used in a concentration of 1 per cent.; with stronger solutions the destructive effect is greater still.

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TREATMENT OF INFANTILE PYLORIC STENOSIS BY ANTISPASMODICS

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The majority of observers regard infantile pyloric stenosis as essentially a disorder of the neuro-muscular apparatus of the gastric outlet, rather than as the result of a hypertrophy of the pyloric muscle of unknown origin. It might have been expected, therefore, that this condition would respond well to medical treatment, but until recently experience has shown that this is not the case. Parsons (1933) states that only 20 per cent. of patients recover if treated medically, whereas a recovery rate of 80 per cent. can be anticipated if Rammstedt's operation is performed. Thompson and Gaisford (1935) in a review of 209 surgical cases find that the death rate was 14.4 per cent. Recently, it is true, Harris and Keynes (1937) have reported thirty-six cases treated surgically with only one fatality (2.8 per cent.), but these figures are exceptional in this country. As a rule surgical treatment may be expected to cure four patients out of five with this complaint, while with the older methods of medical treatment the majority of cases ended fatally.

Treatment by Eumydrine

In December, 1935, Svensgaard published the results of treating congenital pyloric stenosis with eumydrine, or atropine methyl nitrate. Only two of sixty-one patients died, giving the remarkably low mortality rate of 3.3 per cent. (or 1.6 per cent. if one death attributed to pyelonephritis is omitted). In this connexion, however, it must be remembered that foreign statistics are invariably better

than British, possibly because in this country a greater distinction is drawn between pyloric stenosis and pyloric spasm, with the result that only the more severe cases are included in any given series.

As soon as Svensgaard's paper was published treatment by eumydrine was started in the Children's Hospital of the Leicester Royal Infirmary, and has since been adopted as the routine treatment. Although the results have not been as brilliant as Svensgaard's, they compare favourably with those of surgical treatment, and there is reason to believe that they will become progressively better. Svensgaard's routine has been closely followed in this series—that is to say, the patients are given subcutaneous saline until diuresis demonstrates that dehydration has been overcome, then 5 c.cm. of a freshly prepared 1 in 10,000 aqueous solution (0.5 mg.) of eumydrine is administered orally half an hour before feeding. The children are breast-fed if possible; for the bottle-fed half-cream dried milk is used. Twenty-one babies have received this treatment. Three were nursed in a private hospital and eighteen in the Children's Hospital. (One baby who was admitted with pyloric stenosis during this period is not included in this series. He was premature, bottle-fed, and febrile. Eumydrine was tried for a few days, and although there was some improvement in regard to the vomiting the child was so ill that it was thought that surgical measures would give him the best chance, Rammstedt's operation therefore being performed. The child died from respiratory infection soon after.)

The three patients in the private hospital all recovered. Of the eighteen in the Children's Hospital three died, and in three eumydrine was apparently ineffective; two of these last were cured surgically, and one by means of syntropan (see below). The total mortality, therefore, was three out of twenty-one patients, or 14.3 per cent. Surgical statistics for the four previous years show a mortality of 23 per cent., ranging from no deaths in eight cases in 1933 to five deaths in twelve cases in 1932.

Of the deaths two occurred from secondary infection (pneumonia) after the pyloric stenosis had apparently been cured. In one of these cases arrangements had actually been made to discharge the patient, when he developed his fatal infection. Since the occurrence of these deaths each child has been nursed in a cubicle, and from that time secondary infection has been unknown in the eumydrine series. The other child died suddenly while taking a breast-feed. This may have been due to alkalosis, and now each patient receives 2 grains of ammonium chloride thrice daily while the vomiting continues.

Seventeen of these twenty-one babies were bottle-fed, so that a high mortality rate was to be expected; the figure of 14.3 per cent. cannot therefore be regarded as unsatisfactory, particularly when the individual fatalities are considered. The average duration of treatment was five and a half weeks, the shortest being two and a half weeks and the longest twelve weeks. Both the last-mentioned were private cases; the one which lasted twelve weeks developed merycism, which greatly prolonged his stay in hospital.

Treatment by Syntropan

As considerable success was experienced from the treatment of infantile pyloric stenosis by eumydrine, or atropine methyl nitrate, it was thought possible that equally good or even better results might follow the use of syntropan, the acid phosphate of dimethyl-dimethylaminopropanol ester of tropic acid, since that compound was stated to

be effective in the treatment of sea-sickness. The first baby to be treated by this drug was one in which eumydrine had apparently failed. After a month's treatment he had not gained weight and was still vomiting. He was then given 10 mg. of syntropan suspended in 2 c.cm. of water orally before each feed. Vomiting practically stopped immediately, but there was a little regurgitation for three weeks, during which time he gained over a pound in weight. He was discharged cured a month after the beginning of treatment by syntropan.

The hopes of success anticipated from this case, however, have not been realized in two subsequent patients. One of these, although the vomiting diminished and the bowels became more regular, developed pneumonia and died six days after admission, in spite of being nursed under conditions of isolation; the other did not respond to syntropan, and after four days of vomiting was treated by eumydrine. This apparently relieved the pyloric stenosis, and he lost all his symptoms and began to gain weight rapidly. Suddenly, however, he developed a temperature of 103° F. and died in a few hours from lobar pneumonia.

Conclusion

The standard of diagnosis adopted was radiological. Although in the great majority of cases visible peristalsis, projectile vomiting, and a palpable pyloric tumour formed a diagnostic triad, in a few cases the pyloric tumour was not felt. At first only these cases were radiographed, but later all were examined radiologically as a routine, as this presents the best method of differentiating pyloric stenosis from pyloric spasm and eliminates any personal factor. I do not myself consider this necessary, since it seems illogical to make two diseases of two conditions of identical age incidence and symptomatology, which are cured by the identical treatment, and which are differentiated only by one physical sign. But in view of the fetish made of the palpable pyloric tumour by many clinicians, radiological diagnosis was considered desirable for the purpose of recording cases.

The efficacy of eumydrine in the treatment of pyloric stenosis has been confirmed, and in the few cases in which it is not successful it is possible that treatment with some other tropic acid derivative such as syntropan will succeed. Further observations are being carried out regarding the place of this and other drugs in the treatment of the condition. Already, however, it is apparent that the problem in the medical treatment of infantile pyloric stenosis is not so much the failure of the antispasmodic as the liability of the patient to secondary infection.

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In the December number of *Colorado Medicine* H. J. Corper pays a graceful tribute to the Viennese pathologist Anton Ghon (1866–1936), who twenty-five years ago described what has since been called the "Ghon tubercle." This periodical, beginning with the January, 1938, issue, has changed its title to *Rocky Mountain Medical Journal*, and at the same time has become the official journal of the Utah State Medical Association.