7. That teaching of clinical anatomy should be carried out in the hospital attached to the school by teachers of anatomy constituting the Clinical Anatomy Unit with effect from the beginning of the second year and last throughout the curriculum.

8. That modern textbooks are urgently required.

9. That the system of examination needs modifications.

10. That the two spare hours per day in the second year should be utilized for the study of elementary pathology and preventive medicine with a view to welding together the disjointed preclinical and detached clinical parts of the under-graduate curriculum.

11. That the introduction of the proposed changes will not only help in bridging the harmful gap between preclinical and clinical studies but will also permit the completion of courses in the senior classes about six months earlier. If vacations are curtailed, the entire medical course may not require more than four calendar years in view of overlapping in courses and concerted effort in teaching only fundamentals instead of details.

12. That the universities concerned are requested to introduce necessary reforms at the earliest possible opportunity.

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USE OF HYDROGEN PEROXIDE AS A MILK PRESERVATIVE

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THIS work was undertaken at the instance of an official enquiry prompted by a commercial firm in order to know whether a limited amount of hydrogen peroxide can be used in preservation of milk for 48 hours longer than raw milk under ordinary condition. Under the Public Health Regulation now in force in the U.K. or India hydrogen peroxide has been classed as a non-permitted preservative in foodstuffs. Although any kind of preservative in a foodstuff has been prohibited under the general restriction order, it is doubtful whether such a course is expedient in the case of hydrogen peroxide where a very small amount is necessary to preserve the milk with hardly any loss of its taste, quality and nutritive value. Besides, the chemical itself on remaining in contact with the organic matter of the foodstuff breaks up into nascent oxygen and water, leaving it quite harmless.

Specially purified metallic free hydrogen peroxide is now being prepared by electrolysis in some places in Italy. In many areas of this country milk is actually being treated by the chemical with success (Romani, 1944). Therefore there is no reason why this method should not be adopted in India where there is an acute shortage of milk in big cities like Calcutta. By treating it with a small dose of the preservative this valuable article of food can be brought here within 48 hours from many distant places where it is found in plenty and can thus solve the milk problem.

The practice of adding hydrogen peroxide to milk was in vogue long ago. Budde, the Danish Engineer, first thought of treating milk simultaneously with heat and hydrogen peroxide. The milk so treated is termed 'Buddeised milk' after his name. By this process one litre of milk is mixed with 15 c.c. of hydrogen peroxide solution of 3 per cent strength. The whole thing is heated for 3 or 4 hours continually at 51°C. The enzymes, *viz*, peroxidase and catalase present in milk, decompose the hydrogen peroxide into nascent and molecular oxygen respectively as well as water. The nascent oxygen and heat act conjointly to destroy the bacteria. The result is that we get a milk which remains fresh for 4 days (*vide* table I) without any loss of taste due to the addition of hydrogen peroxide. Yet the method is open to objection on the ground that it is not only impracticable from the commercial viewpoint, but that the continued action of heat and oxygen act deleteriously upon the vitamins present in the milk. Besides, the commercial hydrogen peroxide solution is likely to add poisonous impurities to the milk (Harvey and Hill, 1937). However, the variety of H_2O_2 solution that has been used in the experiment has been tested to be free of such impurities except a little citric acid and sodium salt. In order to avoid this sort of trouble as also instability of its strength, solid compound of hydrogen peroxide with urea has been prepared in the laboratory in the following way. This compound is perfectly stable in the dry state at ordinary temperature and its equivalent amount has been used in the experiment just as liquid H_2O_2 solution without any difference (*vide* table II).

Method of preparation

1.8 gm. of urea is dissolved in 30 c.c. of alcohol. To this are added gradually with gentle shaking 30 c.c. of H_2O_2 solution of 10 vol.

strength. A trace of citric acid is then added to the mixture for stabilizing the hydrogen peroxide. The whole thing is kept overnight in ice chamber. The alcohol from the mixture is then distilled under reduced pressure at ordinary temperature (35°C.). The residue is poured over a shallow dish and treated with a little absolute alcohol and left under electric fan to evaporate slowly. After a while beautiful, white prismatic crystals of urea peroxide, $CO(NH_2)_2, H_2O_2$ appear. These are drained as far as possible from the mother liquor and then washed with a little absolute alcohol to free them from impurities. They are then dried over calcium chloride under vacuum.

The strength of the crystal in terms of H_2O_2 has been determined to be 30 per cent (theoretical—34 per cent). The compound is hygroscopic. It decomposes at 60°C. into urea, water and oxygen. It is otherwise quite stable in the dry state and can be compressed into tablets. One gramme of the tablet dissolved in 10 c.c. of water produces H_2O_2 of 10 vol. strength. Each tablet weighing 16 grains is enough to keep a pint of milk fresh for 48 hours if kept in an open vessel. Any trace of H_2O_2 is hardly perceptible to the palate after the interval. It completely disappears on heating the milk.

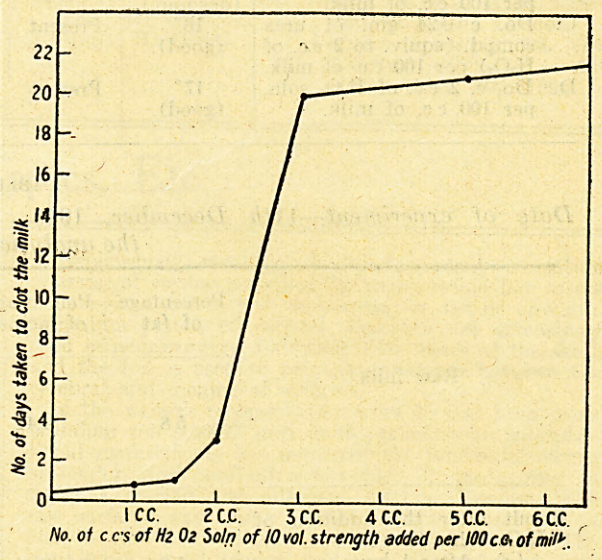
TABLE I

Date of experiment—27th September, 1946
Finding the dose of H_2O_2 per 100 *c.c. of raw milk*

Nature of milk	Dose of H_2O_2 soln. (10 vol. O) in c.c. added to 100 c.c. of milk within 3½ hours of collection	Time of clotting
1. Raw cow milk (pure) ..	1.0	24 hours.
2. Do. do. ..	1.5	Do.
3. Do. (Buddeised)	1.5	4 days (closed bottle).
4. Raw milk (above) ..	2.0	3 days (open bottle).
5. Do. ..	3.0	18 days.
6. Do. ..	5.0	Not clotted after 20 days.
7. Pasteurized (Keventer)	5.0	21 days.
8. Do. ..	7.5	Do.
9. Raw milk (pure) ..	7.5	Not clotted after 20 days.

In order to find the minimum dose of H_2O_2, 100 c.c. of the same raw milk of acidity 16° are taken in several uniform conical flasks and treated with progressive doses of H_2O_2 of 10 vol. strength within 3 hours of milking cow. The flasks are plugged with cotton-wool and kept at laboratory temperature (85°F.) for observation. It has been found that with doses below 2 c.c. of the peroxide solution, the milk invariably curdles within and after 24 hours, while the milk having this dose remains fresh for at least 3 days if kept in an open flask. The closed flask containing the dose just decomposes within 48 hours (*vide* table V).

Observation has also been made on Keventer's pasteurized milk as well as on raw milk with higher doses of the H_2O_2 solution, which keep it fresh for about 3 weeks. It has been calculated that roughly 2/5ths of an ounce of H_2O_2 solution of 10 vol. strength costing about ½ an anna is enough to keep a pint of milk sweet for 48 hours. One company is understood to manufacture it at 10 as. per lb. A graph has been drawn showing relationship between the doses of peroxide solution and the number of days to clot the milk.



Experiments were conducted to compare the action of the urea peroxide compound with that of the H_2O_2 of 10 vol. strength. 100 c.c. of the same raw milk were taken in each of the five uniform conical flasks. To the flask A is added 0.12 gm. of the compound equivalent to 1 c.c. of H_2O_2 solution. To the flask B 1 c.c. of H_2O_2 solution is taken. To the flask C 0.24 gm. of the compound and to the flask D 2 c.c. of the H_2O_2 solution are added respectively. The fifth flask O containing only milk serves as the control. All the flasks are plugged with cotton-wool and kept for 24 and 48 hours for observation. The results are as shown in the table. There is hardly any difference between the solid compound and its equivalent of H_2O_2 solution so far as keeping quality and taste are concerned. It is noticed that with the insufficient dose of either, no trace of H_2O_2 is found to be present, but peroxidase remains, while with the proper dose or above, H_2O_2 persists during the interval to the total destruction of the peroxide.

This experiment is performed with a view to knowing what effect the optimum dose, *viz* 2 c.c., produces on the raw milk after 48 hours so far as the analytical constants, vitamin A and vitamin C are concerned.

TABLE II

Date of experiment—27th November, 1946. Comparison of the solid urea compound with liquid H_2O_2 solution

Nature of milk	Result after 24 hours			Result after 48 hours			Remarks
	Acidity	H_2O_2	Peroxidase	Acidity	H_2O_2	Peroxidase	
O. Raw milk (acidity 16°) ..	70° (curdled).	*Nil*	Present	Curdled	*Nil*	Present	
A. Do. c 0.12 gm. of urea compd. (equiv. to 1 c.c. of H_2O_2) per 100 c.c. of milk.	19° (st. acid).	*Nil*	Trace	Curdled	*Nil*	Trace	Just decomposes after 24 hours.
B. Do. 1 c.c. of H_2O_2 soln. per 100 c.c. of milk.	21° (decomp.).	*Nil*	Trace	Curdled	*Nil*	Trace	Decomposes after 24 hours.
C. Do. c 0.24 gm. of urea compd. (equiv. to 2 c.c. of H_2O_2) per 100 c.c. of milk.	16° (good).	Present	*Nil*	17°	Trace	*Nil*	Decomposes after 3 days.
D. Do. c. 2 c.c. of H_2O_2 soln. per 100 c.c. of milk.	17° (good).	Present	*Nil*	18°	St. trace.	*Nil*	Decomposes after 3 days.

TABLE III

Date of experiment—11th December, 1946. Effect of the optimum dose on the vitamins and the analytical figures

Raw milk	Percentage of fat	Percentage of lactose	Vitamin C	Vitamin A	Remarks	
					Normal	
	5.8	4.44	0.25 mg. per 100 c.c.	0.7 I.U. per c.c.	Vitamin C 0.7 mg. per 100 c.c.	Vitamin A 2 I.U. per c.c.
Result after the addition of H_2O_2 soln. (2 c.c.)—						
(*a*) After 1 hour ..	5.8	3.94	0.14 mg.	..	..	..
(*b*) After 24 hours ..	5.8	3.90	0.11 mg. (cf. 0.19 mg.)	..	Raw milk	
(*c*) After 48 hours ..	5.8	3.90	0.10 mg.	0.7 I.U.	..	..

It is found that the fat percentage remains unaltered but the lactose is lightly reduced due to oxidation; vitamin A remains unaltered, while vitamin C decreases by 44 per cent from the original value. In passing it is noticed that the raw milk under experiment is rather poor in both the vitamins compared with normal milk. The reason is that the cow is stall fed and not allowed to graze. In India the question of deriving vitamin C from milk is ruled out in as much as the people generally use milk after boiling. This destruction of vitamin C by H_2O_2 may, however, be compensated by taking supplementary food, *e.g.* orange juice, etc.

Experiments were conducted to note what difference it makes by taking milk in closed bottles as well as in open bottles with 1 c.c. and 2 c.c. of the H_2O_2 solution per 100 c.c. of milk. In table V the experiment was done in a confirmatory way. It was found that the milk in the open bottle kept longer than in the closed bottle and during the same period more acidity developed in the latter. The reason why this is

TABLE IV

Result after addition of different doses of H_2O_2 solution to closed bottle as well as to open bottle to 100 c.c. of milk

	Dose of H_2O_2 soln.	Acidity	H_2O_2	Peroxidase
		After 24 hours		
Open bottle	*Nil* (raw milk).	89° (decomp.)	*Nil*	Present
	1 c.c.	22° (curdles on heating).	*Nil*	Trace
	2 c.c.	16° (good)	Present	*Nil*
		After 48 hours		
	Nil (raw)	106° (decomp.)	*Nil*	Present
	1 c.c.	70°	*Nil*	*Nil*
	2 c.c.	16° (good)	Present	*Nil*
Closed bottle.	1 c.c.	73° (decomp.)	*Nil*	*Nil*
	2 c.c.	28° (curdles on heating).	*Nil*	*Nil*

TABLE V (*confirmatory*)

Result with 2 c.c. of H_2O_2 solution after 48 hours

	Acidity	Peroxidase	H_2O_2
(1) Open bottle	16°	*Nil*	V. M. trace
(2) Closed bottle	21°	*Nil*	*Nil*
(3) Raw milk without H_2O_2.	78°	Present	*Nil*

so will be ascertained in the subsequent investigation.

Summary and conclusion

The minimum dose of hydrogen peroxide solution to preserve the milk for 48 hours is found to be 2/5ths of an ounce or 16 grains of the solid compound per pint. The milk so treated should be kept preferably in an open vessel. Vitamin A is not affected but vitamin C is somewhat reduced. The analytical constant, *viz* fat percentage, remains the same, while the lactose percentage is slightly reduced. The taste of milk is hardly altered by the small trace of H_2O_2 left behind which, however, disappears on boiling.

My thanks are due to the Director, All-India Institute of Hygiene and Public Health, and to the Director, School of Tropical Medicine, for their interest in the work.

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Current Topics, Etc.

The Use of Tantalum in Tendon Reconstruction of the Hand

By R. C. PEARLMAN

(Abstracted from the *United States Naval Medical Bulletin,* Vol. 46, November 1946, p. 1647)

IN tendon reconstruction, active and passive motion are demanded within a few days following surgery to reduce the inevitableness of permanent immobility. To keep the swelling at a minimum the following criteria must be observed: (*a*) Traumatize the tissues as little as possible; (*b*) there must be no constrictive tissue; and (*c*) the proper application of a pressure dressing.

To permanently prevent adherence and obtain freely functioning tendon, the writer reports in this article his personal experience in the use of tantalum as an interpositional substance. Various metals and alloys have been buried in the tissues of the body by surgeons for the past 3 or 4 hundred years. For a metal or an alloy to be satisfactory in the presence of tissue fluids it must be 'inert' physically and chemically. After fulfilling this basic requirement, further physical characteristics the metal or alloy should possess are ductility, malleability, that it can be 'cold-rolled' and its ability to be tempered to various degrees of hardness. It was not until 1936 that a 'metal-like' material was produced that fulfilled any of these requirements. That was vitallium, an alloy of the following consistency: cobalt 65 per cent, chromium 30 per cent and molybdenum 5 per cent.

Vitallium possesses only one of the chemico-physical properties listed, 'inertness' in the presence of the body fluids. Screws, nails and plates of this alloy are in use, especially in bone work, but all have to be cast. It cannot be drawn into wire or shaped with a hammer at the operating table. Since the stainless steels vary so much in composition, they all, so far, irritate the tissues, and their use is limited almost entirely to sutures. At present, there is only one metal-like substance that possesses four of the necessary chemico-physical properties. It is tantalum.

Tantalum is a basic element discovered by Ekeberg of Sweden in 1802. It possesses the following properties: (1) Inertness, (2) malleability, (3) ductility, (4) it can be cold-rolled. It can be purchased as sutures, ribbon, foil, plates and screws. Laboratory studies show that there is no inflammatory reaction when tantalum is buried in the tissues. It appears totally inert. The tissues in contact show no tendency of disintegration and the tantalum appliance does not loosen or cause a foreign-body reaction. It handles easily as suture material of various sizes but the writer would like to see a finer-sized suture and an increase in tensile strength. Tantalum plates, of varying thickness, are extensively used in neurosurgery, following bone losses of the skull, and the foil is used to prevent adherence between the cerebral and meningeal surfaces.

In the writer's reconstructive work he has been using tantalum foil 0.00025 inch in thickness as an interpositional material. It has improved the functional results of tendon work and often has made it unnecessary to resect a scarred and adherent tendon. Tendon with raw surfaces was simply encased within tantalum foil and the foil held in place with catgut ligatures. The tantalum-wrapped tendon was then dropped back into its normal channel. A pressure dressing was applied and the part immobilized for three or four days. At the end of that time active and passive motions were begun. The pressure dressings were reapplied and no splinting was necessary. The tantalum foil did not need to be removed. Examination of the tendon at the end of four to six weeks showed the tendon 'free' in its channel. The foil was found fragmented and closely adherent in part to adjacent tissues. The tendon itself was coated with a glistening layer of cells. The gauge of foil was not always available, and the writer then was forced to use heavier foil. The results with the heavy foil contra-indicate its use, as it slid about, often causing pressure necrosis of the skin, and in addition it had to be removed, making another operation necessary.

The writer feels that the results he has obtained with tantalum foil justify its continued use.

Penicillin in the Treatment of Louse-Borne Relapsing Fever

By H. S. INGRAHAM

and

R. G. LAPENTA

(Abstracted from the *United States Naval Medical Bulletin,* Vol. 46, November 1946, p. 1719)

1. FIFTY-TWO patients with Egyptian louse-borne relapsing fever received 1,000,000 units of penicillin each in 25,000 unit doses intramuscularly every 3 hours. A cure of the relapsing fever was obtained in all 52 cases.