that $\frac{N}{10}$ NaOH should at least have been included if not primarily recommended for the purpose of titration for acidity.

Alizarin Solution is used as indicator for determining all but the combined HCl, and should be included in the list.

Stains.—Gram's stain, as described in the list, is very unstable and has to be made fresh at least every week, if not oftener. The adoption of the Nicolles modification of this stain would materially aid the laboratory man, inasmuch as it is easily made and almost indestructible as far as time and exposure are concerned.

As decolorizing agents may be included:

Three percent in Alcohol for the Acid-fast stains and Acetone (1), Alcohol (3) for the Gram stain.

Why dehydrated alcohol is used in the preparation of Gram's stain as outlined on page 624 is a mystery to me. Inasmuch as this stain is supposed to be made by shaking the aniline with water, filtering the saturated aqueous aniline solution and then pouring this into a solution of dehydrated alcohol and water it appears that a corresponding amount of Alcohol U. S. P. could be used in place of the dehydrated alcohol.

Counter Stain.—Dilution of 1 : 4 of carbol fuchsin is recommended for that purpose. From practical experience I have found a dilution of 1 : 15 or 1 : 20 much more satisfactory.

In conclusion I wish to compliment the Revision Committee upon having done this pioneer work in an attempt to standardize Diagnostic Reagents and hope that subsequent revisions will eradicate the relatively unimportant errors which have crept into the present chapter on this subject, and that more of the important reagents with detailed information as to mode of preparation and preservation will be incorporated therein.

THE QUALITY OF SOME DRUGS AVAILABLE ON THE MARKET AND PURCHASED ON PRESCRIPTION, WITH METHODS OF ANALYSIS.*

BY L. F. KEBLER with the collaboration of W. O. EMERY, E. C. MERRILL, A. G. MURRAY, E. K. NELSON, S. PALKIN, B. H. ST. JOHN, G. C. SPENCER AND C. D. WRIGHT.

During the year 1912, a goodly number of samples of tincture of iodine were purchased in the open market and examined. The results[1] showed great variation from the standard. A review of the published records shows that the findings of the state officials were equally unfavorable not only for this drug but many others. Tincture of iodine is a comparatively simple drug to prepare and the element of complexity is therefore eliminated. It is held by some that tincture of iodine is a relatively unimportant drug and should therefore not form the basis of an investigation. It should be remembered that tincture of iodine has a fairly good demand, is quite frequently manufactured and is therefore relatively fresh, and on the whole is believed to serve as a good indicator of the care exercised by

* Presented in abstract before the Washington City Branch, A. Ph. A.

[1] J. A. PH. A., 2, 514, 1913; *J. Ind. Eng. Chem.*, 5, 484, 1913.

the druggist in the manufacture of his commodities. In fact, it has been observed that if carelessness exists in the manufacture of one product, it is likely to find a place in the manufacture of other commodities. It would therefore appear that whatever the underlying cause or causes may be they obtain quite generally throughout the United States.

Some time after the results on tincture of iodine referred to above were published, samples of various drugs were procured from time to time. The samples included Aromatic Spirit of Ammonia, Camphor Liniment, Lime Water, Paregoric, Soap Liniment, Spirit of Camphor, Spirit of Nitrous Ether, Tincture of Iodine and Compounded Prescriptions. The results of the investigation follow.

The work for each product examined is grouped under three headings, *viz.*, Methods of Analysis, Summary of Analysis and Comments. The methods of analysis given are either new, improvements on existing processes, or old methods tried out. In some cases it was not deemed necessary to give the method.

AROMATIC SPIRIT OF AMMONIA.

METHODS OF ANALYSIS.

Ammonium Carbonate.[2]—Introduce a suitable quantity of the sample to be examined into a burette, and guarding against loss, measure off accurately 10 mils into a 200 mil Erlenmeyer flask, containing about 50 mils of water; add an excess of $\frac{N}{2}$ sulphuric acid, boil until the carbon dioxide is expelled and the greater part of the essential oils are volatilized; cool, titrate the excess of acid with $\frac{N}{2}$ sodium hydroxide solution, using methyl red as indicator. Let (*a*) represent the number of mils of acid neutralized by the sample.

Measure off 10 mils of the sample into a 200 mil volumetric flask, containing about 100 mils of water, add 20 mils of barium chloride solution, approximately normal (10 percent), dilute to the mark with water, agitate 6 or 8 times during the next six hours and allow it to stand for 18 additional hours; filter, collecting the filtrate in an accurately graduated cylinder, guarding against loss of ammonia by evaporation. Note the volume of the filtrate, titrate with $\frac{N}{2}$ hydrochloric acid, using methyl red as indicator. From these results calculate the amount of $\frac{N}{2}$ acid necessary to neutralize the entire 200 mils (the original volume). Let (*b*) represent the number of mils of $\frac{N}{2}$ hydrochloric acid necessary.

The difference between (*a*) and (*b*) represents the ammonium carbonate. Since the acid carbonate originally present in the ammonium carbonate was neutralized by a portion of the ammonia water added, it is evident that (*b*) represents only the excess of ammonia water and the difference between (*a*) and (*b*) is the amount of acid sufficient to neutralize both the ammonium carbonate originally used and the ammonia water neutralized by the bicarbonate. The acid equivalent to the original carbonate is therefore three-fourths of the difference between (*a*) and (*b*).[3] One mil of $\frac{N}{2}$ acid is equivalent to 26.19 Mg. ammonium carbonate. If the difference between (*a*) and (*b*) is multiplied by $^3/_4$ of 26.19 (equal to 19.64) the result is the number of Mg. of ammonium carbonate in 10 mils of the sample.

Check, if desired. The precipitated barium carbonate may be washed and either titrated with a standard acid solution or dried, gently ignited at a dull red heat and weighed. From the results obtained the amount of ammonium carbonate can readily be calculated.

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[2] Unless otherwise indicated the term Ammonium Carbonate means the U. S. P. product. This work was all done previous to the issuing of the 9th Decennial Revision of the U. S. P. and the 8th Rev. therefore obtains unless otherwise noted.

[3] For details see comments on this article.

Ammonia Water.—To (*b*) add one-fourth the difference between (*a*) and (*b*). The sum is the number of mils of $\frac{N}{2}$ acid equivalent to the ammonia used as ammonia water in 10 mils of the sample. Each mil of $\frac{N}{2}$ acid is equivalent to 0.089 mil ammonia water.

Example: 10 mils of the sample of aromatic spirit of ammonia required 31.2 mils (*a*) of $\frac{N}{2}$ acid for neutralization. 184 mils of the filtrate from the barium carbonate precipitate required 13.25 mils of $\frac{N}{2}$ acid for neutralization equivalent to 14.4 (*b*) mils for the entire 200 mils. 31.2 (*a*) — 14.4 (*b*) = 16.8. 16.8 × 19.64 = 330.0 Mg. or 0.33 Gm. of ammonium carbonate per 10 mils of sample, which is equivalent to 33 Gm. of ammonium carbonate per liter. 14.4 (*b*) + 4.2 ($^1/_4$ (*a*) — (*b*)) = 18.6. 18.6 × 0.089 = 1.50 mils ammonia water per 10 mils of sample. This is equivalent to 150 mils ammonia water per liter, an excess of 67 percent.

Alcohol.[4]

Sodium Sulphate Solution: 30 grammes of U. S. P. sodium sulphate dissolved in enough water to make 45 mils. Introduce 20 mils of the sample into a separatory funnel containing 30 mils of the sodium sulphate solution, render acid by gradually adding sulphuric acid (1 in 1) with careful shaking; finally add 5 mils of the acid in excess. Remove the oils by shaking out twice with an equal volume of petroleum ether. Transfer petroleum ether into a second separatory funnel. Introduce the aqueous portion into a distilling flask. Extract the combined petroleum ether with several successive portions (5 mils) of the sodium sulphate solution; add washings to distillation flask, distil into a 50 mil volumetric flask, make up to exact volume and determine the percentage of alcohol by volume from the specific gravity in the usual manner. All measurements must be made at the same temperature. The percentage of alcohol in the original material is two and one-half times that contained in the distillate.

Summary of Analysis.—Number of samples examined, 52. Eighteen, or 35%, came within a 10% variation of the standard in ammonia content; 21, or 40%, came within 15% and 28, or 54%, came within a variation of 20%. The ammonium carbonate content varied even more.

A goodly number of the samples contain excessive amounts of ammonia water; one as much as 154%. A number of samples were found of proper strength.

Comments.—Ammonium Carbonate consists of a mixture of ammonium acid carbonate and ammonium carbamate.[5] The product therefore is not well named. Formerly it consisted of one molecule of neutral ammonium carbonate to two molecules of the acid carbonate. The composition seems to vary with the method of manufacture.[6] All calculations are made on the basis of equimolecular proportions of ammonium hydrogen carbonate and ammonium carbamate.

The object of the addition of free ammonia in the official process is to convert the insoluble bicarbonate into the carbamate. . . .[7]

E. Divers[8] reports that "By digesting crystals of the salt ("Ammonium Carbonate") with water saturated at a low temperature with ammonia gas for two or more days, at a temperature of 20° to 25°, they dissolve in apparently unlimited quantity, and are changed into ammonium carbamate."

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[4] See comments on alcohol determination.

[5] U. S. P. Eighth Rev., p. 41; Schmidt, Pharm. Chem., vol. 1, 5th ed., p. 659, 1907; Roscoe and Schorlemmer, "Treatise on Chemistry," vol. 2, p. 385, 1907.

[6] Schmidt, Pharm. Chem., vol. 1, 5th ed., p. 659, 1907.

[7] U. S. Disp. p., 1171, 19th ed., 1907.

[8] *J. Chem. Soc.*, 33, 187, 1870.

On mixing ammonia gas with carbon dioxid in the absence of moisture ammonium carbamate is formed, $2NH_3 + CO_2 = NH_2CO.ONH_4$. Ammonium carbamate is quite stable in the absence of water. When mixed with water it is converted into normal ammonium carbonate but according to Macleod and Haskins[9] the change proceeds only until a condition of equilibrium is established between the ammonium carbamate and neutral ammonium carbonate as is indicated by the following equations: $NH_2CO.ONH_4 + H_2O \rightleftarrows (NH_4)_2CO_3$.

The time required for precipitating the barium carbonate may be reduced to one hour by heating. For this purpose 10 mils of the sample, 30 mils of water and 20 mils barium chloride solution are placed in a pressure flask, the flask securely stoppered and introduced into a water bath, maintained at a temperature not less than 75° C.

All determinations should be checked, with sample prepared according to formula and of known composition.[10]

The reactions involved in the above methods for estimating the ammonium carbonate and ammonia water are as follows:

1. $NH_4HCO_3 + NH_4NH_2CO_2 + xNH_4OH = NH_4NH_2CO_2 + H_2O + (x - 1)NH_4OH$.

2. $NH_4NH_2CO_2 + H_2O \rightleftarrows (NH_4)_2CO_3$.

3. $(NH_4)_2CO_3 + NH_4NH_2CO_2 + 2H_2SO_4 = 2(NH_4)_2SO_4 + 2CO_2 + H_2O + 2NH_4OH + H_2SO_4 = (NH_4)_2SO_4 + H_2O$.

4. $(NH_4)_2CO_3 + BaCl_2 + (x - 1)NH_4OH = BaCO_3 + 2NH_4Cl + (x - 1)NH_4OH$.

5. $NH_4OH + HCl = NH_4Cl + H_2O$.

The alcohol content was determined only in special samples. The data therefore being incomplete, they are not reported in this article. The methods of analysis are however given.

CAMPHOR LINIMENT.[11]

METHODS OF ANALYSIS.

Camphor.—(*a*) Into a flat-bottomed, tared evaporating dish, place about 5 Gm. of the sample accurately weighed, heat at 150° C. until practically constant weight is secured and the odor of camphor is no longer perceptible. The loss in weight represents the amount of camphor contained in the liniment under examination.

(*b*) Determine the optical rotation in a 200 mm. tube and from the result obtained calculate the amount of camphor present. Example: Optical rotation of sample +31.4° on sugar scale. Optical rotation of standard sample[12] +58.5° on sugar scale.

Summary of Analysis.—Of the 42 samples examined, 17, or 40%, come within a 10% limit. 24, or 57%, come within a 15% limit, and 28, or 67%, come within a 20% variation from the standard. A deviation of 20% from the standard should be ample for an article of this character. Yet on this basis nearly one-third of the samples examined would be defective.

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[9] *J. Biol. Chem.*, 1, 321, 1906.

[10] This procedure should be adopted whenever practicable.

[11] The 9th Rev. Dec. U. S. P. recognized "Camphorated Oil" a synonym of camphor liniment which eliminates an old-time controversy.

[12] See comments.

Comments.—Prepare a standard sample of camphor liniment by accurately weighing 20 Gm. of powdered dry camphor into a 200 mil saponification flask, then add exactly 80 Gm. of cottonseed oil, seal or tightly cork the flask, heat on a water bath with occasional shaking until solution results, finally cool the mixture to room temperature. The sample so prepared will read approximately +58.5° on the sugar scale at room temperature. This preparation should be used to check all determinations made. The standard should be freshly prepared for each series of determinations. Optical readings of the sample under investigation and the standard sample should be made under the same conditions.

The two methods above outlined give fairly concordant results as the following parallel figures show:

	Polariscope.	Loss by heating.
1 Camphor	7.18%	7.38%
2 Camphor	13.80%	14.56%
3 Camphor	8.5 %	8.58%
4 Camphor	2.1 %	2.0 %
5 Camphor	9.2 %	9.24%
6 Camphor	6.9 %	7.0 %
7 Camphor	8.6 %	8.65%
8 Camphor	14.9 %	15.28%
9 Camphor	8.7 %	8.35%
10 Camphor	6.6 %	6.74%
11 Camphor	26.15%	26.71%
12 Camphor	15.4 %	16.2 %
13 Camphor	11.5 %	11.5 %
14 Camphor	12.8 %	13.1 %

The loss on heating includes any moisture that may be present, so that the figures obtained by this procedure may be a trifle higher than those obtained by the optical method. If the article is turbid it should be filtered before making the determination of camphor.

If the product is made in an open vessel or is unduly heated without guarding against loss by evaporation the content of camphor will be low. The amount of camphor in the sample examined is therefore ascertained from the proportion: +58.5° : +31.4° : : 20 : X. X therefore equals 10.8%, the amount of camphor present in the sample examined.

LIME WATER.

Method of Analysis.—U. S. P. 8th Revision.

Summary of Analysis.—Of the 62 samples examined, 47, or 76%, came within 20% of the standard and 49, or 79%, within 25%. A majority of the defective samples were decidedly below standard and an increase to a 45% variation would show but little improvement. There is no upper limit. A deficiency of 99% does not speak well for any product.

PAREGORIC.

METHODS OF ANALYSIS.

Reagents.—Sodium hydroxide, 10%.

Common salt.

Alkaline salt solution, made by saturating a $2\frac{1}{2}$ to 3% sodium hydroxide solution with a common salt and filtering.

Barium chloride, a saturated solution.
Concentrated hydrochloric acid.
Concentrated ammonia.
Alcohol.
Chloroform, containing 5 to 7% alcohol.
Methyl red (0.2% alcoholic solution).

Morphine.—(*a*)[13] Evaporate 200 mils of the sample to a volume of 50 or 60 mils, transfer to a separatory funnel, rinsing the vessel in which the evaporation was made with several small portions of water, adding the rinsings to the separatory funnel. Shake out 3 times with 20 mils of chloroform, collecting the chloroform in another separatory funnel. Wash the combined chloroform with 5 mils of water, withdraw and add it to the main aqueous layer. Discard the chloroform, introduce the aqueous solution into a beaker, rinse the funnel with several small portions of water, adding the rinsings to the beaker. Heat the beaker on the water bath until the chloroform is expelled, then add 20 mils of 10% sodium hydroxide and mix well. Transfer into a 200 mil graduated flask containing 1 Gm. of powdered common salt for every 3 mils of the solution, add 15 mils of water, stopper the flask, and shake gently until the salt is dissolved. Rinse the beaker with several portions of alkaline salt solution adding the rinsings to the graduated flask, and dilute with the same solution to about 175 mils, rotate gently so as to mix without causing excessive frothing. Add 15 mils of saturated solution of barium chloride. Reduce the froth by the addition of a little alcohol and make up to volume with alkaline salt solution, stopper, shake thoroughly, then filter through a large, dry fluted paper. Refilter if filtrate is turbid.

By means of a pipette remove 100 mils of the filtrate corresponding to half the weight of the sample taken and introduce into a separatory funnel No. 1. Add concentrated hydrochloric acid in portions—towards the end not over 1/2 mil at a time until acid to litmus, finally add 4 mils in excess; add concentrated ammonia in portions—towards the end not over *4 drops at a time*—until alkaline, then add 1 mil in excess. It is important that the quantities of acid and ammonia be added with the precision indicated. Add 10 mils of alcohol and shake out 6 times with chloroform, containing 5 to 7% alcohol, using 30, 20, 20, 15, 15 and 15 mils, respectively, filter each successive shake-out through cotton wetted with chloroform, into a separatory funnel No. 2. Discard the liquid in separatory funnel No. 1.

To funnel No. 2 add 15 mils of alkaline salt solution, shake, then withdraw the chloroform layer into a separatory funnel No. 3. To funnel No. 3 add 5 mils of alkaline salt solution, shake, withdraw the chloroform layer into a beaker and add the alkaline salt layer to funnel No. 2. Return the chloroform to funnel No. 3, shake with a fresh portion of 5 mils alkaline salt solution, reject the chloroform layer and keep the alkaline salt layer for later use. Shake out the alkaline salt solution in funnel No. 2 twice with 25 mils of chloroform each time, collecting the chloroform in separatory funnel No. 3. Shake funnel No. 3. Reject the chloroform layer and add the alkaline salt layer to the main alkaline salt solution in funnel No. 2.

To funnel No. 2 add concentrated hydrochloric acid *carefully*, reaching acidity within *2 or 3 drops;* then add 1 mil in excess. Add concentrated ammonia carefully, reaching alkalinity within *1 or 2 drops;* then add 5 drops in excess. Add 3 mils of water and 4 mils of alcohol. Shake out 5 times with chloroform containing 5 to 7% of alcohol, 30, 10, 10, 5 and 5 mils, respectively, filtering each successive shake-out through cotton wetted with chloroform into a beaker.

Evaporate the chloroform on the water bath to dryness. Add 10 mils of neutral alcohol and heat to dissolve. Add 3 to 5 drops of methyl red. Add $\frac{N}{50}$ sulphuric acid until about 2 to 5 mils in excess. At this stage look out for any undissolved specks; heat again if necessary. Evaporate most of the alcohol, cool, then titrate back with $\frac{N}{50}$ or $\frac{N}{100}$ sodium or potassium hydroxide which has been ascertained to be sufficiently free from carbonates to give a sharp end point with methyl red.

[13] Developed by H. E. Buchbinder based on the work of Kippenberger (*Z. anal. Chem.*, 34, 307, 1895; *Ibid.*, 39, 290, 1900); Warthle (*Chem. Ztg.*, 25, 290, 1901); Puckner (*J. Am. Chem. Soc.*, 23, 470, 1901); and Eaton (*Bull. Bur. Chem.*, 137, 188, 1911); *Ibid.*, 152, 242, 1911.

(*b*)[14] When not more than 50 to 100 mils of paregoric are available for assay, the above method may be modified by using the centrifuge to separate the emulsion formed when shaking with chloroform.

The sample, to which 2 mils normal H_2SO_4 have been added, is evaporated on the steam bath to a volume of about 10 to 15 mils, then transferred to a separator (which has been tested in the centrifuge and found to show no loss when centrifuged half full of chloroform for five minutes) or to an eight-ounce nursing bottle. Rinse in the last portions of the evaporated residue with two portions of half normal H_2SO_4, each portion 10 mils. The solution is then saturated with salt and carefully neutralized by adding NH_4OH conc., drop by drop, finally adding 5 drops in excess. Then add 30 mils of a mixture containing 85% by volume chloroform and 15% alcohol by volume, shake and centrifuge till a clear separation is effected, then remove the immiscible solvent—from the milk bottle by means of a pipette—and run it into a large separator.

The operation is repeated with successive portions of 30, 20, 20, and 15 mils, respectively, of the solvent mixture. A portion of the last shake-out should be evaporated to dryness on the steam bath and tested with formaldehyde-sulphuric reagent to insure complete extraction of the morphine. In case the test is positive the shaking-out must be repeated till no reaction is noted on a few mils of the shake-out.

Having completed the chloroform-alcohol shake-out and collected the solvent in a separator, add to the latter 15 mils of a saturated salt solution containing $2^1/_2\%$ NaOH and shake. Remove the chloroform alcohol to another separator and shake again with 10 mils of the alkaline salt solution.

Run off the chloroform alcohol into a beaker and transfer the alkaline salt shake-out into the first separator, then pour the chloroform-alcohol back into the second separator and shake again with 10 mils of the alkaline salt solution, and add this shake-out to the others in the first separator. Then wash these combined shake-outs with 5 to 10 mils chloroform. Reject the chloroform.

Exactly neutralize by adding conc. HCl, drop by drop, finally adding 1 mil in excess. Cool under the faucet and shake with 5 to 10 mils chloroform, remove the chloroform to another separator and shake it with 5 mils saturated salt solution to which 3 drops conc. HCl have been added. Discard the chloroform and add the acid salt solution to the sample in the first separator.

Now add conc. NH_4OH till the solution is just alkaline, and then 8 drops in excess. Cool under the faucet and extract immediately with successive portions of 30, 30, 20, 20 and 15 mils, respectively, of chloroform to which 5 to 7% by volume alcohol has been added, testing the final shake-out with formaldehyde-sulphuric reagent for complete extraction. Repeat shaking-out if necessary. The chloroform shake-outs are filtered through paper or a pledget of cotton, wetted with chloroform, into a flask, most of the chloroform distilled off and the remainder rinsed into a small tared beaker, evaporated on the steam bath to dryness and dried at 100°, weighed or dissolved in 3 to 5 mils neutral alcohol and titrated with $\frac{N}{50}$ acid, using methyl red as indicator.

Alcohol.—Introduce 25 mils of the sample into a distillation flask, dilute with two volumes of water, add about 1 Gm. sodium bicarbonate, mix well; slowly distil about 50 mils into a separatory funnel, saturate the distillate with common salt and shake out twice with about 15 mils of petroleum ether. Separation of the two liquids must be complete. Transfer the hydro-alcoholic salt solution to a suitable distillation flask. Wash the combined petroleum ether extract with successive portions of 10 and 5 mils, respectively, of a saturated salt solution, and add washings to distillation flask. Distil slowly into a 50 mil volumetric flask and make up accurately to 50 mils. All measurements must be made at the same temperature. The alcohol content of the distillate is calculated from the specific gravity in the usual way. On account of dilution the alcohol in distillate is one-half that contained in the original material.

Summary of Analysis.—Ninety-nine samples were examined, of these 72, or 73%, came within a 20% variation and 23, or 23% exceeded a 25% variation.

[14] Elaborated by B. H. St. John.

It should be noted that in all cases the excessive variations are represented by deficiencies, for example, —92, —82, —72%, etc.

Comments.—The directions should be followed to the letter and the determination should be carried out as rapidly as is consistent with careful manipulation. On no consideration should the morphine be allowed to remain in the alkaline salt solution for any considerable time, over $^1/_4$ to $^1/_2$ hour, as loss of morphine due to oxidation occurs.

It has been found to be imperative to keep the proper ratio of NH_4OH to ammonium salts in the solution to be extracted, hence the specific directions in regard to the addition of acid and ammonia.

It is also imperative in the final shake-out with chloroform to shake immediately after making alkaline, for while freshly precipitated morphine is readily extracted by the solvent used, if allowed to stand it becomes crystalline and its extraction becomes very difficult.

The procedure for estimating the morphine is somewhat involved on account of the small amount and the other ingredients contained therein. Considerable practice is also required to obtained accurate results. Experienced workers, however, obtain fairly concordant results.

The method for estimating alcohol differs in several particulars from the procedure given by Thorpe and Holmes,[15] or as modified by E. Richter[16] or A. Reuss.[17] Experience shows that in many cases a preliminary distillation of the original material before salting out and extracting with petroleum ether facilitates shaking-out and distillation and gives better results.

(*To be continued.*)

TUBERCULINS.*

BY L. K. DARBAKER.

"Tuberculosis was, without doubt, recognized and described by the early writers of medicine, but at that time it was known only under the general name 'consumption'—a name that to the present day is still in common use. This name was given the disease from the fact that patients dying from it have certain symptoms, such as loss of weight, good appetite, morning cough, night-sweats, and, although in apparent good health, going down slowly and easily to certain death—each sufferer always hopeful to the latest minute of life. Upon opening the bodies of these patients nodules or tubercles were found in the various affected parts; hence this name.

"Tuberculosis is a simple infection, caused by the *Tubercle streptothrix*, and is rarely fatal. The body, in protecting itself, forms a wall around the invading organism; hence the tubercle."

"Consumption is a complex infection in which the various streptococci and staphylococci are associated with the tubercle organism. The streptococci and

[15] *J. Chem. Soc. Trs.*, 83, Pt. I, 314, 1903.

[16] *Pharm. Ztg.*, 59, 430, 1914.

[17] *Pharm. Zentrh.*, 56, 61, 1915.

* Read before Pittsburgh Branch, A. Ph. A.