stroyed by either of several strengths solution of iodine acting for varying periods of time. Thus, death occurs after an exposure to a 1/500 solution for fifteen minutes; to a 1/300 solution for ten minutes; to a 1/200 solution for one minute. Considering the inhibitive effect of the solutions on the micro-organism, we find that this power begins to appear quite perceptibly on exposing to a 1/1000 solution for fifteen minutes. This effect is increased in proportion as the time of exposure is lengthened. On exposing to solutions of greater strength for a shorter period than is necessary to cause death, i. e., 1/500 solution for ten minutes, 1/300 solution for five minutes, the inhibitory effect becomes, to a medium degree, greater and greater, although time of exposure is markedly decreased. Therefore, in this series, we may consider that iodine has a medium range of inhibition before causing death.

GENERAL SUMMARY.

In summing up the antimicrobial power possessed by iodine in solution, it is well for clearness to adhere to the two divisions previously made. These were: (1) The death point of the micro-organisms as expressed by the strength of solution employed and the time of exposure to same; (2) the inhibitory effect of solutions as expressed by retardation and limitation of growth. Taking for consideration the first division, the evidence shows that absolute destruction of the several micro-organisms occurs when they are exposed to the solutions as given in Table 92.

Micro-organism.	Strength of solution.	Time of exposure.
<i>Streptococcus pyogenes</i>	1/1000	30 minutes
	1/500	2 minutes
<i>Blastomycosis</i>	1/500	4 minutes
<i>Actinomycosis bovis</i>	1/500	15 minutes
	1/300	10 minutes
	1/200	1 minute
<i>Staphylococcus pyogenes aureus</i>	1/200	5 minutes
<i>Bacillus tuberculosis</i>	1/200	60 minutes
	1/100	7 minutes
<i>Bacillus anthracis</i> plus spores	1/200	60 minutes
	1/100	10 minutes
<i>Bacillus prodigiosus</i>	1/100	10 minutes

A considerable range in efficiency of solutions is shown to exist between the *Streptococcus pyogenes* and the *Bacillus prodigiosus*. On the *Streptococcus pyogenes* the effect of the iodine is almost, if not altogether, a specific. The same, to a lesser degree, may be said of its action on *Blastomycosis*. As per the arrangement of the table, the *Staphylococcus pyogenes aureus* is seen to occupy, in its relation to resisting power, a middle position. In regard to this same power of resistance, a wide space intervenes between the *Staphylococcus aureus* and the bacilli group, of which the non-pathogenic *prodigiosus* is the most hearty. However, the employment of the strongest solution necessary (1 per cent. for ten minutes) is eminently practicable in direct application to wound surfaces without bad effects resulting. The fact that a micro-organism is or is not pathogenic has no weight in determining its power of resistance.

Taking for consideration the second division, it is readily seen that the degree of inhibition depends both singly and jointly on the strength of solution employed and the duration of exposure to the same. This inhibitory cycle is well shown by the bacilli group where there is a gradual and progressive increase in the inhibitory power over a wide range as the solutions become stronger and stronger and the time of exposure is increased in each strength. On this group iodine has a marked range of inhibition before producing death. The inhibitory sphere in *Staphylococcus pyogenes au-*

reus is irregular in character and much smaller because of the lesser strength of solution causing death. Likewise, for the same cause, *Actinomyces* presents a still more restricted sphere, although steadily progressive in character. On both *Streptococcus pyogenes* and *Blastomycosis* the range of inhibition is so minute, because the death and inhibitory points are practically the same, that it may be disregarded.

CONCLUSIONS.

1. In a solution of iodine, varying from a 0.2 per cent. to a 1 per cent., we have a germicidal agent of very marked potency.

2. Its germicidal power is far superior to that of bichloride of mercury, the acknowledged leader of all other antiseptics. This fact was shown by experiments made with a 1/1000 solution of bichloride of mercury on *Streptococcus pyogenes*, using the same method employed with iodine solution. It was found that an exposure of fifteen minutes, although showing considerable inhibitory power, especially on the first day, permitted a good growth of streptococci to appear. An exposure of thirty minutes gave no growth. The superiority of iodine is readily evidenced by recalling the fact that a comparatively weak solution of iodine, i. e., 0.2 per cent., gave death after two minutes' exposure.

3. It approaches nearly to the ideal antiseptic in that:

(a) It is easily prepared and is stable.

(b) It is non-toxic and non-irritating in strength effective, being only one-fourth as toxic as bichloride of mercury.

(c) It does not coagulate albumin or form inert compounds with tissues.

(d) It is effective in a very brief time.

(e) The stain it produces soon disappears.

(f) Lastly, and most important, it possesses a remarkable penetrating power.

4. In conclusion, it is well to state that an 0.5 per cent. solution is amply strong enough for all practical usage.

390 North Clark Street.

THE UNITED STATES PHARMACOPEIA.

THE ADVANCE IN PHARMACY INDICATED IN THE EIGHTH DECENNIAL REVISION.*

C. S. N. HALLBERG, PH. G., M.D.

CHICAGO.

The Pharmacopeia was made public June 27, when unbound copies of the book were sent to medical and pharmaceutical journals, medical publishers, authors, and such other persons to whom avoidance of the two weeks' delay in securing bound copies of the volume would be especially appreciated.

THE NOMENCLATURE.

The Pharmacopeia, as the exponent of the science of drugs and medicine, must employ a terminology in harmony with the related sciences, hence the importance of the nomenclature. With reference to the nomenclature the convention adopted the following among the general principles to be followed in revising the Pharmacopeia:

It is recommended that changes in the titles of articles at present official be made only for the purpose of insuring greater accuracy or safety in dispensing. In the case of newly admitted articles it is recommended that such titles be chosen as are in harmony with general usage and convenient for prescribing.

* Read in the Section on Pharmacology of the American Medical Association, at the Fifty-sixth Annual Session, July, 1905.

ing; but in the case of chemicals of a definite composition a scientific name should be given, at least a synonym.

It is recommended that every common name and English title of articles used in the present United States Pharmacopeia that is synonymous for both the medicinal and commercial drug be either discarded or modified so as to leave no doubt as to what is wanted.

With reference to the chemical nomenclature, that of the former revision has been retained notwithstanding the fact that the spelling adopted by the American Association for the Advancement of Science and chemical societies has met with some degree of favor. The deletion of the final *e* in the halogens and alkaloids, such as "bromine," "iodine" and "morphine" and "quinine," respectively, it was thought, would prove confusing; besides, the alkaloids would lose the distinction they have always enjoyed in being written with the final *e*, from the glucosids without it, i. e., aloin, santonin, etc. So also was the substitution of *f* for *ph* in the case of sulphur and sulphates (sulfates), regarded probably as too much of an innovation, especially when the spelling of "Pharmacopeia" was considered. The spirit of conservatism was so evident that the convention refused even to eliminate the *o* in the spelling of "Pharmacopeia," although the British is the only other Pharmacopeia which retains this ancient spelling.

Another innovation was narrowly averted when the figures for the elements of the International Committee on Atomic Weights of 1904 were adopted, based on hydrogen at 1 instead of oxygen at 16, which would have made H 1.008. The fear of innovation did not deter the committee, however, from making some timely corrections in chemical terms, such as changing the official titles for three well-known acids: carbolic, arsenous and chromic to phenol, arseni-trioxidum and chromi-trioxidum respectively; resorcinol for resorcin, potassii hydroxidum for potassa, sodii hydroxidum for soda, the *id* termination for salts of alkaloids, i. e.: cocainæ hydrochloridum for cocainæ hydrochloras, the contracted term "fluidextractum" for extractum-fluidum, and the less doubtful substitution of chloralum hydratum for chloral as being liable to confusion with chlor. hydr., when carelessly abbreviated.

PURITY AND STRENGTH OF PHARMACOPEIAL ARTICLES.

The limitations on the purity and strength of pharmacopeial articles have received much consideration, especially during the past decade, because of the extreme requirements, in some instances characterized as hypercritical by manufacturers. Having in mind, no doubt, the greatest protection to the public, the convention gave the following instruction:

The committee is instructed to revise as carefully as possible the limits of purity and strength of the pharmacopeial chemicals and preparations for which limiting tests are given. While no concession should be made toward a diminution of medicinal value, allowance should be made for unavoidable, innocuous impurities or variations due to the particular source or mode of preparation, or to the keeping qualities of the several articles. In the case of natural products, the limits of admissible impurities should be placed high enough to exclude any that would not be accepted by other countries.

To the present revision, therefore, has been added a descriptive definition for each chemical known as the "purity rubric," which defines and limits the gross amount of impurities in each article by stating, for example, potassii iodidum: "It should contain not less than 99 per cent. of pure potassium iodide (KI=164.76)."

To make this article 100 per cent. pure would not only add vastly to the cost but in this particular salt would result in a product which would be stable. In the elaborate tests which follow, the amounts of alkali, nitrates and nitrites, chlorids and bromids are carefully limited within the total one per cent. permissible, while they absolutely exclude all noxious salts, such as barium, cyanid and heavy metals, lead, tin, zinc, etc. By this method, the highest practically attainable degree of purity is secured with the certainty that all noxious impurities are absent.

ASSAY PROCESS.

The standardization of drugs and their preparations also for certain principles has long been a desideratum. The medical profession has especially favored this idea because it represented an apparently decided advance in therapeutics. It was also in line with the entire spirit of the Pharmacopeia, and the ideals of pharmacy, viz.: to secure uniformity in strength and dosage. Its application, however, was an entirely different and much more difficult proposition than fixing the uniformity of chemical substances from the fact that the principles of but comparatively few drugs are as well defined as ordinary chemical substances, and their identity and determination, therefore, require much more careful and elaborate study. For this reason the committee was instructed:

The committee is instructed to append assay processes to as many of the potent drugs and preparations made therefrom as may be found possible, provided that the processes of assay are reasonably simple (both as to methods and apparatus required) and lead to fairly uniform results in different hands. As regards the products of such assays, tests of identity and purity should be added wherever feasible. Physiologic tests for determining strength should not be introduced by the committee.

After exhaustive study by a committee of specialists, some of whom have been engaged with the various large manufacturing pharmaceutical houses, assay processes were introduced for eighteen drugs and their preparations, and the following standards have been adopted for them:

Drugs and their preparations for which standards of active principles are required by the U. S. P. VIII.

Preparation.	Principle.	Minimum.
Aconitum	Aconitin	0.5 per cent.
Fluidextractum Aconitin		0.4 in 100 c.c.
Tinctura	Aconitin	0.045 in 100 c.c.
Belladonnæ folia	Mydriatic alkaloids	0.35 per cent.
Emplastrum	Mydriatic alkaloids	0.38-0.42 per cent.
Extractum	Mydriatic alkaloids	1.4 per cent.
Tinctura	Mydriatic alkaloids	0.035 per cent.
Belladonnæ radix	Mydriatic alkaloids	0.5 per cent.
Fluidextractum	Mydriatic alkaloids	0.5 in 100 c.c.
Cinchona	Alkaloids	4 per cent. ether soluble.
Fluidextractum	Alkaloids anhydrous	4 in 100 c.c.
Coca	Alkaloids ether soluble	0.5 per cent.
Fluidextractum	Alkaloids ether soluble	0.5 per cent.
Colchicæ cortex	Colchicin	0.5 per cent.
Extractum	Colchicin	1.4 per cent.
Colchicæ semen	Colchicin	0.55 per cent.
Fluidextractum	Colchicin	0.5 in 100 c.c.
Tinctura	Colchicin	0.05 in 100 c.c.
Conium	Coniin	0.5 per cent.
Fluidextractum	Coniin	0.45 in 100 c.c.
Guarana	Alkaloids	3.5 per cent.
Fluidextractum	Alkaloids	3.5 in 100 c.c.
Hydrastis	Hydrastin	2.5 per cent.
Fluidextractum	Hydrastin	2 in 100 c.c.
Tinctura	Hydrastin	0.4 in 100 c.c.
Hyoscyamus	Mydriatic alkaloids	0.08 per cent.
Extractum	Mydriatic alkaloids	0.3 per cent.
Fluidextractum	Mydriatic alkaloids	0.075 in 100 c.c.
Tinctura	Mydriatic alkaloids	0.007 in 100 c.c.
Ipecacuanha	Alkaloids	2 per cent.
Fluidextractum	Alkaloids	1.75 in 100 c.c.
Jalapa	Alcal soluble resin	8 per cent.
Nux vomica	Strychnin	1.25 per cent.
Extractum	Strychnin	5 per cent.
Fluidextractum	Strychnin	1 in 100 c.c.
Tinctura	Strychnin	0.1 in 100 c.c.

Opium pulvis and		
deodorata.....	Morphin cryst.....	12 to 12.5 per cent.
Extractum.....	Morphin cryst.....	20 per cent.
Tinctura and deo-		
dorized tinctura	Morphin cryst.....	1.2 to 1.25 in 100 c.c.
Physostigma.....	Ether soluble alkaloids.....	0.15 per cent.
Extractum.....	Ether soluble alkaloids.....	2 per cent.
Tinctura.....	Ether soluble alkaloids.....	0.014 in 100 c.c.
Pilocarpus.....	Alkaloids.....	0.5 per cent.
Fluidextractum.....	Alkaloids.....	0.4 in 100 c.c.
Stramonium.....	Mydriatic alkaloids.....	0.35 per cent.
Extractum.....	Mydriatic alkaloids.....	1.4 per cent.
Fluidextractum.....	Mydriatic alkaloids.....	0.35 in 100 c.c.
Tinctura.....	Mydriatic alkaloids.....	0.03 in 100 c.c.

The introduction of several principles of volatile oils, some artificial or synthesized, led to the fixing of standards for a number of the natural volatile oils, which are required to be of the following strengths:

Oil.	Principle.	Strength.
Oleum amygdalæ		
amaræ.....	Benzaldehyd.....	85 per cent. w't.
	Hydrocyanic acid.....	2.4 per cent. w't.
Oleum cajuputi.....	Cineol.....	55 per cent. vol.
Oleum caryophylli.....	Eugenol.....	80 per cent. vol.
Oleum cinnamomi.....	Cinnamic aldehyd.....	75 per cent. vol.
Oleum eucalypti.....	Cineol.....	50 per cent. vol.
Oleum thuonis.....	Citral.....	4 per cent. w't.
Oleum menthæ		
piperitæ.....	Menthyl acetate.....	5 per cent. w't.
	Total menthol.....	50 per cent. w't.
Oleum pimentæ.....	Eugenol.....	65 per cent. vol.
Oleum rosmarini.....	Formyl acetate.....	5 per cent. w't.
	Total borneol.....	15 per cent. w't.
Oleum santali.....	Santalol.....	99 per cent. w't.
Oleum thymi.....	Phenols.....	20 per cent. vol.

In addition to this class of principles, already official menthol, thymol and methyl salicylate, the following have also been introduced:

BENZALDEHYDUM: An aldehyd obtained from the volatile oil of bitter almond or produced artificially, containing 85 per cent. pure benzaldehyd.

CINNALDEHYDUM: An aldehyd obtained from oil of cinnamon or prepared synthetically, containing not less than 95 per cent. pure cinnamic aldehyd.

EUGENOL: An unsaturated aromatic phenol obtained from oil of cloves and other sources.

SAFROLUM: The methylene ether of pyrocatechol, found in oil of sassafras, camphor oil and other volatile oils.

The difficulty presented in work of this branch of organic chemistry may be realized from the fact that of these eighteen drugs not one glucosidal drug is included, they being, with one exception, (jalap) alkaloidal. While to devise assay processes which would be practicable and which, in the hands of the average skilled pharmacist, would show fairly uniform results, was exceedingly difficult with some of these. notably the mydriatic group, with glucosidal drugs these difficulties were unsurmountable. For this reason, there are no assay processes nor standards for the principles of digitalis, ergot, strophanthus and several more of this class, much as it was desired to include them. By far the largest number of drugs are glucosidal in character and yet, with a few exceptions, they are but little known. There are many drugs indigenous to North America, not to mention Central and South America, whose principles, if studied systematically, would furnish valuable therapeutic agents, perhaps equally as valuable as the coal-tar and other synthetic chemicals. This field may well be called a *terra incognita* which lies fallow for a medical Vespuccio or Vasco de Gama, but more likely which will be chartered and explored by the *omnium gatherum* Teutons when they have exhausted the possibilities of the Benzene ring and its congeners.

Owing to the lack of chemical assay methods for standardizing some of these drugs, certain manufacturers have adopted so-called physiologic methods for determining the strength and potency. Since no method based on pharmacodynamic effects could be applied by the average retail pharmacist for whom the U. S. Pharmacopeia is, first of all, designed, and since any re-

quirement for an article which could not be verified by him would, it was contended, violate this fundamental principle of the Pharmacopeia, it was recommended "that physiologic tests should not be introduced."

Owing to the importance of the subject, however, and with the aid of a special committee composed of Major Walter Reed, surgeon U. S. A., Prof. Theobald Smith, Thomas C. Craig, surgeon U. S. A., H. A. Hare, E. M. Houghton, J. J. Kinyoun, William H. Park, Herbert D. Pease, and M. J. Rosenau, surgeon U. S. Public Health and Marine-Hospital Service, the following standard was adopted:

SERUM ANTIDIPHThERICUM—Antidiphtheric serum. Diphtheria antitoxin.

A fluid separated from the coagulated blood of a horse *Equus caballus* (Linné), immunized through the inoculation of diphtheria toxin. It should be kept in sealed glass containers in a dark place, at temperatures between 4.5 and 15 C. (40 and 59 F.).

A yellowish or yellowish brown, transparent or slightly turbid liquid, odorless or having a slight odor, due to the presence of the antiseptic used as a preservative.

Specific gravity: 1.025 to 1.040 at 25 C. (77 F.).

Antidiphtheric serum gradually loses its power, the loss in one year varying between 10 and 30 per cent. Each container should be furnished with a label or statement, giving the strength of the antidiphtheric serum, expressed in antitoxic units, the name and percentage by volume of the antiseptic used for the preservation of the liquid (if such be used), the date when the antidiphtheric serum was last tested, and the date beyond which it will not have the strength, indicated on the label or statement.

The standard of strength expressed in units of antitoxic power should be that approved or established by the United States Public Health and Marine-Hospital Service.

Average dose, 3,000 units.

Immunizing dose for well persons, 500 units.

The admission of the synthetics, owing to the complex status of many of them, was a difficult problem to solve. The attitude of the convention was not sharply outlined in the following instruction to the committee:

The Committee of Revision is authorized to admit into the Pharmacopeia any product of nature of known origin, also any synthesized product of definite composition which is in common use by the medical profession, the identity, purity or strength of which can be determined. No compound or mixture shall be introduced if the composition or mode of manufacture thereof be kept secret, or if it be controlled by unlimited proprietary or patent rights.

Realizing the desire on the part of the medical profession to have, at least, made official as many of this class of articles as have proved of therapeutic value and have assumed a permanent place in the materia medica, the committee compromised by admitting such products for which the patent on the process or product, or both, expired or will expire during the present decade (1910), provided that, by such expiration, the trade name would also become free.

With this as a guide, the legal status of the most extensively employed synthetics was investigated, and those which would be free during the stated period were admitted. Some omissions will be noted, for example, ichthyol, which is not covered by any patent, the name alone being registered, and the article, therefore, is in the category of so-called patent medicines, except that its composition is well known.

Except in the case of antipyrin, which became free several years ago, the trade names of these articles have not been admitted, but instead more or less euphonious contractions of the chemical names have been adopted

for their title, together with the chemical structural names, as follows:

ACETPHENETIDIUM—Acetphenetidin: $C_{10}H_{13}NO_2 = 177.79$.

A phenol derivative [Acetparaphenetidin $C_6H_4(OC_2H_5).NH.CH_3.CO:4$] the product of the acetylation of para-amido phenol.

Average dose, 0.500 gm., 500 milligrams ($7\frac{1}{2}$ grains).

ÆTHYLIS CARBAMAS—Ethyl Carbamate: $C_5H_7NO_2 = 88.42$.

An ester of carbamic acid [$CO(OC_2H_5)NH_2$] obtained by the reaction of ethyl alcohol on urea (carbamide) or one of its salts. It should be kept in well-stoppered bottles.

Average dose, 1 gm. (15 grains).

ANTIPIRYNA—Antipyrin: $C_{11}H_{12}N_2O = 186.75$.

Phenyldimethylpyrazolon [$C_8H_8N_2O(CH_3)_2.C_6H_5$], obtained by the condensation of phenylhydrazin with aceto-acetic ether, and methylation of the product.

Average dose, 0.25 gm., 250 milligrams (4 grains).

BENZOSULPHINIDIUM—Benzosulphinid Saccharin.

The anhydrid of ortho-sulphamide-benzoic acid (benzoyl sulphonicimide).

Average dose, 0.200 gm., 200 milligrams (3 grains).

CHLORALFORMAMIDUM—Chloralformamid: $C_3H_4Cl_2NO_2 = 190.96$.

A crystalline solid [$CCl_3.CH(OH).NH.CO$], made by the direct union of formamide with anhydrous chloral. It should be kept in amber-colored, well-stoppered vials.

Average dose, 1 gm. (15 grains).

GUAIACOLIS CARBONAS—Guaiacol Carbonate: $(C_7H_7O)_2.CO_2 = 272.05$.

A guaiacol derivative [$(C_6H_4(OCH_3)_2)_2.CO$], obtained by the action of carbonyl chlorid on sodium-guaiacolate.

Average dose, 1 gm. (15 grains).

HEXAMETHYLENAMINA—Hexamethylenamin: $C_6H_{12}N_4 = 139.18$.

A condensation product [hexamethylene-tetramin, $(CH_2)_6N_4$], obtained by the action of ammonia on formaldehyd. It should be kept in well-stoppered bottles.

Average dose, 0.250 gm., 250 milligrams (4 grains).

HOMATROPINÆ HYDROBROMIDUM—Homatropin hydrobromid: $C_{16}H_{21}NO_3.HBr = 353.49$.

The hydrobromid [$HBr.C_{16}H_{21}NO_3$] of an alkaloid obtained by the condensation of tropin and mandelic acid. It should be kept in well-stoppered vials, protected from light.

Average dose, 0.0005 gm., 0.5 milligram ($1/128$ grain).

IODOLUM—Iodol: $C_4I_4.NH = 566.17$.

Tetraiodopyrrol, a derivative of the base pyrrol, obtained by the direct action of iodine on the base in the presence of alcohol. Iodol should be preserved in amber-colored bottle, protected from light.

Average dose, 0.250 gm., 250 milligrams (4 grains).

METHYLTHIONIÆ HYDROCHLORIDUM—Methylthionin Hydrochlorid. Methylene Blue: $C_{16}H_{18}N_3S.Cl = 317.36$.

Tetramethylthionin hydrochlorid, obtained by the action of hydrogen sulphid on an oxidation product of paramido-dimethylanilin.

Average dose, 0.250 gm., 250 milligrams (4 grains).

SULPHONETHYLMETHANUM—Sulphonethylmethane: $C_8H_{18}S_2O_4 = 240.46$.

Di-ethyl-sulphone-methyl-ethyl-methane [$(CH_3)(C_2H_5)C(SO_2C_2H_5)_2$], a product of the oxidation of the mercaptol obtained by the condensation of methylethylketone with ethyl mercaptan. It should be preserved in well-stoppered vials.

Average dose, 1 gm. (15 grains).

SULPHONMETHANUM—Sulphonmethane: $C_4H_6S_2O_4 = 226.55$.

Diethylsulphonedimethylmethane [$(CH_3)_2C(SO_2C_2H_5)_2$], the product of the oxidation of the mercaptol obtained by the condensation of acetone with ethylmercaptan. It should be preserved in well-stoppered vials.

Average dose, 1 gm. (15 grains).

THYMOLIS IODIDUM—Thymol Iodid: $C_{10}H_{14}O_2I_2 = 545.76$.

Dithymol-diiodid [$(C_6H_2.CH_3.C_3H_7.OI)_2$], obtained by the condensation of two molecules of thymol and the introduction of two atoms of iodine into the phenolic groups of thymol; it contains 45 per cent. of iodine. Thymol iodid should be kept in amber-colored vials, protected from the light.

VANILLINUM—Vanillin: $C_8H_8O_3 = 150.92$.

Methylprotocatechuic aldehyd [$C_6H_3.OH.OCH_3.CO$ 4:3:1], occurring naturally in vanilla or made artificially from several orthodihydroxybenzene derivatives.

Average dose, 0.030 gm., 30 milligrams ($\frac{1}{2}$ grain).

Special Articles

IMMUNITY.

CHAPTER XXIV.

BACILLUS ENTERITIDIS IN MEAT POISONING.

More or less extensive epidemics of poisoning by meats have long been known. Whereas, it was formerly thought that the intoxication was due to ptomaines which were formed as an incident to putrid decomposition of meat, it is now well established that most epidemics of this character are caused by meats which are infected with bacteria which are pathogenic even when entirely freed from decomposing proteids.

Botulism has already been described as a special form of meat poisoning in which nervous symptoms predominate, and it has also been emphasized that paratyphoid fever may have its source in infected meat. Before these conditions were recognized, however, Gärtner in 1888 had the opportunity of studying an epidemic caused by the meat of

a cow which had been slaughtered in extremity. The symptoms differed from those of botulism or paratyphoid, as described below. He obtained from the muscle and spleen of the cow, and from the spleen of a man who had been fatally poisoned by meat, an organism which has since been known as *Bacillus enteritidis* (Gärtner). The same bacillus, or organisms which resemble it closely, have been obtained repeatedly during similar epidemics, both from the suspected meat and from the organs in fatal cases (intestines, blood, spleen, etc.). Drigalski, from a comparative study of several strains which had been obtained from different sources, concluded that all are members of a closely related group of organisms, the group of *Bacillus enteritidis*. His conclusions were based on cultural properties and agglutination tests.

The typical organism is a short rod, often ovoid in shape; it possesses four to twelve long flagellæ and has moderate motility. It is not stained by Gram's method. It ferments dextrose and certain other sugars, lactose, galactose, maltose, cane sugars, etc., with gas formation. Variations among individual strains need not be discussed here.

According to v. Ermengem, and also Drigalski, the pathogenicity of the organism depends on its elaboration of a soluble but heat resistant toxin. Bouillon cultures twelve days old, in which the bacteria have been killed by heat, also similar

cultures from which the bacteria have been removed by filtration, are toxic for mice and guinea-pigs (Drigalski). It is noteworthy, however, that relatively large quantities of the bouillon were necessary to kill guinea-pigs (4.0 c.c.), which is in contrast to the toxins of diphtheria and tetanus. The rapidity with which symptoms develop following the ingestion of infected meat is a further indication of the existence of this soluble toxin. Symptoms occasionally

develop so quickly as to suggest some strong metallic poisoning. Within a few hours vomiting, violent diarrhea and colicky pains set in, followed by more or less collapse, weakness, headache and not uncommonly by trythematous, urticarial or herpetic eruptions. Fever is absent or inconspicuous. The mortality is not high, from 2 to 5 per cent., although convalescence is said to be slow. Neplritis and catarrhal pneumonia have been noted as