Collagenes and **Mucilaginous Bodies,** include Ossein, Collagen (and their derivative Gelatin), also Elastin, Chondrin, Keratin and Mucin.

Ferments are known only by their power of effecting peculiar changes in other organic bodies. The true ferment-substances have not yet been isolated, but they are present in certain preparations obtained from animals and plants, the most important of which are named in the following list, viz.—

Pepsin,—contained in the gastric juice of animals.
Pancreatin,—obtained from the pancreas of animals.
Papayotin (Papain),—from the sap of Carica papaya.
Bromelin,—contained in the juice of the Pineapple.
Ptyalin,—the peculiar ferment of animal saliva.
Diastase,—formed during the germination of seeds.
Emulsin,—the ferment occurring in almonds.
Myrosin,—the ferment contained in mustard-seeds.

The first four above-named are described under the title PEPSINUM, *Diastase* under AMYLUM, *Emulsin* under AMYGDALA, and *Myrosin* under SINAPIS, in Part I of this book.

CLASSIFICATION OF MEDICINES.

In the present state of knowledge respecting the actions and uses of medicinal agents, no really scientific classification of these substances is possible. Some writers have adopted a system based on the natural relations of the various articles to each other, while many classify them according to their effects on the human system, and others make no attempt at arrangement but treat of them in alphabetical order. The latter method has been chiefly followed in this work, from a conviction that every medicine should first be studied as an individual, both with respect to its physiological actions and its therapeutical applications. When the student has thus made himself familiar with the characteristic features of each article of the materia medica, he may begin, by comparing one with another, to seek acquaintance with their more delicate lights and shades. Some system of classification then becomes imperative as an aid to the memory, and as the titles of the groups to which the various agents belong in any physiological classification are also used to express their actions and uses, the following synopsis is inserted as an appropriate introduction to the section on Materia Medica and Therapeutics.

Accommodation of the Eye is impaired or paralyzed by the following named drugs, acting upon the ciliary muscle, viz.—

Atropine.	Homatropine.	Cocaine.
Daturine.	Physostigmine.	Gelsemine.
Hyoscyamine.	Pilocarpine.	Coniine.

Intraocular tension is increased by Atropine (large doses), Hyoscyamine and Daturine; and is decreased by Physostigmine and by Cocaine. Gelsemine paralyzes the external ocular muscles, especially the levator palpebræ and external rectus, by its action on the terminal nerve filaments.

Acids are compounds containing the electro-positive element Hydrogen united directly to strongly negative elements, or as the negative radicle Hydroxyl (HO) united to positive elements. The terminal syllables of their names indicate the comparative amount of oxygen or other electro-negative constituent present, those terminating in *-ic* having the greater quantity, those ending in *-ous* having the lesser quantity. When there are more than two such combinations the prefix *hyper-* is affixed to the highest, and *hypo-* to the lowest. Many strong acids (as hydrochloric) contain no oxygen, but all contain hydrogen. They change the color of litmus from blue to red, and unite with bases to form salts. Their physiological actions are chiefly due to their powers of neutralizing alkalies, withdrawing water from the tissues, and precipitating the globulins and some other proteids. They are poisonous to protoplasm, somewhat antiseptic, and many of them are powerfully corrosive to the tissues. Taken internally in dilute solution they have a sour taste, and cause an astringent sensation in the mouth and throat, induce a reflex flow of saliva, and in the stomach displace weaker acids from their combinations. Applied to the mouths of ducts from glands having an alkaline secretion they stimulate the latter, but check the secretion of glands producing acid secretions. This doctrine has but a limited application, as they do not pass beyond the stomach in their own form, though they increase the flow of the alkaline pancreatic juice by reflex action. In the blood and tissues they exist as salts by combination with the alkalies of the body, and if administered in sufficient quantity to neutralize the latter the animal dies, its blood being unable to carry carbon dioxide from the tissues to the lungs. They are rapidly excreted by the kidneys as acid salts, increasing the acidity of the urine. Therapeutically they are employed locally as caustics, styptics and anhydrotics, and internally in very dilute form as refrigerants, stomachics, astringents, hemostatics, and antidotes in poisoning by alkalies.

Incompatible with Acids generally are: Alcohol with strong acids; Alkalies, Alkaloids; Benzoates and Borates with strong acids; Bismuth and Ammonium Citrate, Bicarbonates, Bromides of weak bases, Carbonates, Chlorides of weak bases, Glucosides, Iodides of weak bases, Metallic Salts with organic acids, Pancreatin, Potassium and Sodium Tartrate, Potassium Tartrate, Salicylates, Silicates. [See also the particular Acids in Part I.]

Alkalies are compounds possessing certain properties in common, viz.—solubility in water, neutralizing acids and with them forming salts, saponifying fats, changing reddened litmus back to its original blue color, and altering the color of turmeric from yellow to brown. The *alkalies proper* are the five fixed alkalies, Potassa, Soda, Lithia, Cæsia, and Rubidia, which are hydrated oxides of the corresponding alkali metals, and the volatile alkali Ammonia, a

gaseous compound of N and H_3. They are strong, electro-positive bases, uniting with acids to form salts. The oxides of calcium, barium, strontium and magnesium are called *alkaline earths*, are but slightly soluble in water, and much less corrosive than the alkalies proper. In medicine the term alkali includes also such salts as have an alkaline reaction, as carbonates, bicarbonates, and borates.

The physiological action of the hydrates and carbonates of the alkali metals is due entirely to their powerful hydroxyl constituent, and depends chiefly on their powers of neutralizing acids, dissolving proteids, saponifying fats, and abstracting water from the tissues. In solid form or concentrated solutions they are energetic corrosives, destroying all living tissues with which they come into contact, the hydrates being the most powerful in this respect. In weak solutions locally they stimulate the cells of the skin and soften the epidermis. Taken internally in dilute solution they have a characteristic taste, and dissolve the superficial layers of the mucous membrane of the mouth and the mucus of the secretions. Small quantities are neutralized in the stomach by the hydrochloric acid of the gastric juice, larger ones neutralize or alkalinize the stomach contents and stop the gastric digestion, slightly irritate the walls of that viscus, improve its circulation, and dissolve its mucus. Applied to the mouths of ducts of glands they are said to stimulate acid secretions and check alkaline secretions, but this is denied by experimental physiologists for the gastric juice, and is shown to be true for the pancreatic secretion only indirectly by diminishing the acidity of the fluid passing through the pylorus. The prolonged administration of large doses of the alkaline carbonates and bicarbonates causes chronic gastro-enteritis in animals. Concentrated solutions of alkalies corrode the walls of the esophagus and stomach, and may prove fatal by causing perforation into the peritoneal cavity. Alkalies have but little influence on metabolism and uric acid excretion, other than that due to their action on digestion. They are rapidly excreted by the kidneys as bicarbonates, rendering the urine less acid or even alkaline in reaction.

Incompatibles. Alkalies are incompatible with many substances. They neutralize free acids, and precipitate alkaloids and soluble non-alkaline metallic salts. Caustic alkalies decompose Bromoform, Chloroform, Chloral, Copaiba, Glucosides, and Resin. Strong alkalies decompose salts in solution which have weak or volatile bases. [See also the individual alkalies, Potassium Hydroxide, etc., in Part I.]

Alkalies may be subdivided into two groups, named, from their physiological actions, *Direct Antacids*, those which lessen acidity in the stomach, and *Indirect* or *Remote Antacids*, which have no power over acidity in the stomach, but are oxidized in the blood, and excreted as carbonates in the urine, decreasing its acidity. The following List of Alkalies comprises the chief members of both groups, and also some which have the actions of both. They should all be largely diluted before administration.

Direct Antacids. (*Lessen Acidity in the Stomach.*)	*Remote Antacids.* (*Lessen Acidity of the Urine.*)
Liquor Potassii Hydroxidi.	Liquor Potassii Hydroxidi.
Liquor Sodii Hydroxidi.	Liquor Sodii Hydroxidi.
Carbonates and Bicarbonates of Potassium, Sodium, Lithium, Magnesium and Ammonium.	Carbonates and Bicarbonates of K, Na Li, Mg and NH_4.
Lime-water. Chalk. Magnesia.	Potassium Acetate and Citrate.
Aromatic Spirit of Ammonia.	Sodium Acetate and Citrate.
	Sodium Phosphate. Lithium Citrate.

Alteratives are remedies which *alter* the course of morbid conditions in some way not yet understood, perhaps by promoting metabolism. They certainly modify the nutritive processes and thereby cure many diseases of chronic type. *Mercury* and *Iodine* are the most prominent agents of this class, the former being endowed with the power of breaking up newly deposited fibrin and disorganizing syphilitic deposits, while the latter acts energetically upon the lymphatic system and promotes absorption. *Arsenic* also is almost specific in many chronic skin affections, and has remarkable power over chronic pulmonary consolidations, probably producing fatty degeneration and softening of the effusion, so that it may be absorbed or expectorated. The principal alteratives are—

Arsenic.	Mercury.	Iodine.
Antimony.	Colchicum.	Iodides.
Aurum.	Guaiacum	Stillingia.
Mezereum.	Sanguinaria.	Sarsaparilla.
Sulphur.	Xanthoxylum.	Cod-liver Oil.
Sulphides.	Calcium Chloride.	Phosphorus.

Amblyopia, or impairment of vision from nerve-changes, is produced temporarily by Quinine, and may be permanently induced by Tobacco and Alcohol, also by Lead and Urea poisoning.

The sensibility of the eye is increased by Strychnine, the field of vision becoming enlarged, and the vision rendered more acute. If the drug be administered hypodermically the improvement will be more marked in the eye corresponding to the side of the body where the injection was made. The sensibility for color is affected by drugs, *Strychnine* increasing the field for blue, *Eserine* diminishing it for red and green, and *Santonin* causing objects to appear at first of a violet and afterwards of a greenish-yellow color.

Analgesics or **Anodynes** (ἀν, without, ἄλγος, pain, ὀδύνη, pain),—are remedies which relieve pain either by direct depression of the centres of perception and sensation in the cerebrum, or by impairing the conductivity of the sensory nerve fibres. *Opium* is the most efficient of all analgesics, because it arrests the afferent impressions at every step of their track—at their formation, along the course of their conduction, and at the point where they impinge on the sensorium. The *Local Anodynes* are described under Anesthetics; the list of *General Anodynes* includes the following-named agents:—

Opium, Morphine.	Antipyrine.	Aconite.
Belladonna, Atropine.	Acetanilide.	Chloroform, Ether, etc.
Cannabis Indica.	Phenacetin.	Conium
Stramonium.	Phenocoll.	Hydrated Chloral
Hyoscyamus.	Exalgin.	Croton-chloral.
Gelsemium.		Lupulus.

Anaphrodisiacs (ἀν, without, *Αφροδίτη*, Venus),—are medicines and measures which lower the sexual function and diminish the sexual appetite. They act by lessening the excitability of the nerves of the genital organs, by depressing the genital centres in the brain and cord, or by decreasing the local circulation. The principal anaphrodisiacs are named in the following list. [Compare APHRODISIACS.]

Bromides.	Tobacco.	Nauseants.
Potassium Iodide.	Digitalis.	Purgation.
Camphor (at last).	Conium.	Venesection.
Opium (at last).	Belladonna.	Ice, locally.
Lupulin.	Stramonium.	Cold Baths.
Cocaine.	Gelsemium.	Vegetable Diet.

A few drops of a 4 per cent. solution of Cocaine upon the glans penis will destroy all erection-power for a quarter to half an hour.

Anesthetics (ἀν, without, *αἰσθήσις*, perception),—are agents which temporarily destroy sensation. The Local Anesthetics are described below. The *General Anesthetics* include certain volatile substances, mostly belonging to the chemical groups named alcohols and ethers, which when inhaled sufficiently produce complete unconsciousness and loss of sensation (anesthesia), also lessened motor power. Narcotics also produce more or less anesthesia, but this term is usually restricted to the effects of the volatile agents referred to above. The principal members of this group are—

Ether (Ethyl Oxide).	Chloroform.
Methylene Bichloride.	Ethyl Chloride.
Ethylene Bichloride	Ethyl Bromide.
Nitrous Oxide.	Pental (Tri-methyl-ethylene).

The list of General Anesthetics also includes Alcohol and many substitution products derived from alcohols and ethers. [Compare the articles entitled ALCOHOL, ÆTHER AND CHLOROFORM in Part I.]

LOCAL ANESTHETICS AND ANODYNES (ἀν, without, *οδύνη*, pain),—reduce the functions of the sensory nerves until they lose the power of receiving or conducting sensations. Some act by direct depression of the end-organs in the skin, etc., others by impairing the conductivity of the sensory nerves, while some act indirectly by reducing the local circulation. The Anodynes diminish, and the Anesthetics destroy, for a time, the sensibility of the skin and mucous membranes to which they are applied. The chief members of this class are named in the following list:—

Local Anesthetics.	*Local Anodynes.*
Extreme Cold Ice.	Aconite, Aconitine.
Ether Spray.	Belladonna, Atropine.
Ethyl Chloride.	Opium, Morphine.
Cocaine, Eucaine	Veratrine.
Tropacocaine.	Menthol.
Chloretone.	Hydrocyanic Acid.
Ouabaïn.	Phenol.
Antipyrine, Acetanilide.	Chloroform, Ether, Alcohol.
Erythrophlœin.	Hydrated Chloral.
Hydrocyanic Acid.	Sodium Bicarbonate.
Creosote, Guaiacol	Zinc Oxide.
Iodoform.	Oil of Turpentine.
Orthoform.	Volatile Oils.
Phenol.	Galvanism.

Anhidrotics (ἀν, without, *ἱδρως*, sweat),—are agents which check perspiration, and are the opposites of the Diaphoretics, which promote this secretion. They usually act either—

1. By depressing the action of the sweat-glands.
2. By depressing the excitability of the sweat-centres.
3. By reducing the circulation in the skin.

The most important agents of this class are those named in the following list, the figures indicating their mode of action as above arranged.

Belladonna.[1]	Acids, locally.[3]	Chloralformamide.
Atropine.[1]	Pilocarpus.	Quinine (?).
Hyoscyamus.[1]	Pilocarpine.	Picrotoxin.
Stramonium.[1]	Nux Vomica.	Dover's Powder.
Muscarine.[2]	Strychnine	Opium[2] (small doses).
Agaricus Albus.[2]	Ergot.[3]	Zinc Salts.[3]
Salvia (Sage).	Sulphuric Acid.	Local Cold.[3]

Strychnine, Atropine, Dover's Powder, Pilocarpine, Picrotoxin and Zinc Salts are all respiratory stimulants, and very efficient against the sweating of phthisis, though most of them are classed as diaphoretics. This is explained by the theory of accumulation of carbonic acid in the blood by depressed respiration caused by severe coughing, this stimulating the sweat-centres, and being opposed by agents which stimulate the respiratory centre.

Antagonists are agents which directly oppose each other in some or all of their physiological actions, and may be used against each other to *counteract* their effects upon the organism. Antagonistic action takes place in the blood and tissues, after the absorption of both the poison and the antagonist; it is available against poisons administered hypodermically as well as by other channels, and so far as drugs are concerned it is applicable chiefly to vegetable poisons or to those which produce their toxic effects after absorption. In most cases of poisoning by vegetable principles absorption has proceeded so far before professional assistance is obtained that the time for antidotes has passed, and reliance can be placed only upon the physiological antagonists and such antagonistic measures as may support vitality until the poison can be eliminated by the excretory organs of the body. There may be an exception to this rule in the case of Morphine, which, after making the round of the circulation, constantly returns in part to the stomach until finally eliminated, so that repeated washing of that organ with a solution of potassium permanganate, or the ingestion thereof from time to time, may have a continuous antidotal action on such portion of the poison as may have been absorbed. [Compare ANTIDOTES.]

Antagonistic Measures include all such procedures as may tend to antagonize any remote effects of poisons, as artificial respiration, faradization of the respiratory muscles, constant motion or absolute repose, application of heat or cold, douching, etc.

Thus, in the case of poisoning by *Digitalis* the antagonists which will counteract the effects of such portion of the drug which has been absorbed are the following: *Aconite* or *Morphine* against the cardiac action, the former for the effects of large doses, the latter for those of the long-continued use of the drug. *Saponin* and *Senegin* are the most complete antagonists against Digitalis, their counteraction extending throughout nearly its entire range of action. *Alcohol* is also indicated, as a cardiac stimulant, and absolute *Rest in the recum-*

bent posture is an antagonistic measure of prime importance, by reason of the liability to sudden cessation of the lowered cardiac action on the assumption of the erect posture by the patient.

In Part I of this book, under the several titles of the poisonous drugs, their most efficient Antidotes and Antagonists are not mentioned; but these are fully described and arranged in a form suitable for reference under the caption POISONING in Part III.

Physiological Antagonism means a balance of opposed actions on particular organs or tissues, excited by medicinal agents and measures or by disease. It may extend throughout the whole or the greater part of the range of action of the opposing agents, or, as is usually the case, may be limited to a few points thereof. There is no instance in which the antagonism of two drugs is absolutely complete along their whole line of action. In a few cases it is nearly so; as with Morphine and Atropine (except as to narcotism), Digitalis and Saponin, and Atropine and Muscarine, the latter being considered the most complete instance known. In most cases the antagonism extends only to certain definite spheres of action, and the antagonists therein may be synergists to each other in other spheres, as the narcosis produced by both Morphine and Atropine. It may be local, affecting a single organ or function, or it may extend to a group of organs, to several associated functions, or over the distribution of the nerves proceeding from a single nerve-trunk (as the vagus) or controlled by a single nerve-centre. Antagonism implies a balance of functional disturbance, not an alteration of structure.

Drugs are rarely antagonistic to each other in the same degree, but, by reason of differences in their mode and time of action, the action of one preponderates over that of the other, so that the latter will not counteract the former to the extent of averting a fatal result, though in the reverse order their counteraction may be most satisfactory. For example, while Chloral is the antagonist to Strychnine, opposing as it does the spinal action of the latter drug, the reverse is true to a very limited extent; and, while Atropine may prevent death from a lethal dose of Aconitine, Morphine or Bromal Hydrate, no one of these three will do so in atropine poisoning.

Two mutually antagonistic principles may exist in the same plant, as the alkaloids Pilocarpine and Jaborine in pilocarpus, and the glucoside constituents of digitalis, one of which, Digitonin, antagonizes the actions of the other three, Digitalin, Digitoxin and Digitalein.

Toxicological Antagonism is a very ancient idea in medicine. Mithridates of Pontus (B. C. 164–124) and other monarchs of the heathen world occupied themselves with the study of poisons and their antidotes and antagonists, established botanical gardens for the purpose of their investigation, and gave their names to what were supposed to be universal preventives against the results of poisoning. In the 16th century Prosper held that theriaca (opium) was an antagonist to all poisons. From 1570 to 1677 many observations were made and published on the treatment of belladonna poisoning by opium, and in 1810 the same matter was made the subject of an inaugural thesis by Lipp. The scientific investigation of drug action and antagonism was not possible until the discovery and isolation of the alkaloids, but followed immediately thereafter, and was begun in 1809 by Magendie upon the upas poison (nux vomica) and its newly discovered alkaloid, strychnine. In 1869 Schmiedeberg and Koppe made their researches on muscarine and atropine, and Liebrich discovered chloral and proved the antagonism of strychnine to its action, the converse of which was shown by Bennett in 1875. In 1870 Fraser published his investigations upon atropine and physostigma, and Preyer his on the antagonistic influence of atropine and hydrocyanic acid on respiration. In 1875 a committee of the British Medical Association made an extended investigation and report on the antagonisms of several drugs, which was supplemented by the work of Vulpian on atropine and pilocarpine in the same year, that of Fothergill in 1877 on aconite, atropine and digitalis, and that of Huseman on the antagonisms of chloral. Much good work has also been done in England by Brunton and Ringer, and in the United States by Wood and Bartholow, on the same lines. The name of Brunton is unalterably associated with the antagonism between amyl nitrite and the spasmodic paroxysm of angina pectoris, a discovery in therapeutic antagonism which was made by him through the exercise of purely scientific reasoning and which has since been applied to the similar paroxysm induced in poisoning by certain drugs, as cocaine.

The following table, modified from Brunton, gives the antagonistic poisons, also their mutual antagonistic and lethal doses in each case in which they have been determined. The doses are expressed in grains or fractions of a grain per pound weight of the animal.

TABLE OF ANTAGONISTIC POISONS.

ANTAGONISTS. I.	II.	ANTAGONISTIC DOSE. I.	ANTAGONISTIC DOSE. II.	LETHAL DOSE. I.	LETHAL DOSE. II.
Aconitine and Atropine,		$\frac{1}{750}$	1$\frac{3}{5}$	$\frac{1}{900}$	7
" " Digitalin,		$\frac{1}{600}$	$\frac{2}{5}$	$\frac{1}{900}$	1
Alcohol and Strychnine,		$\frac{1}{750}$	$\frac{1}{125}$	$\frac{1}{900}$	$\frac{1}{288}$
Atropine and Aconitine,		....	....	....	$\frac{1}{288}$
" " Chloral,		....	....	7	$\frac{1}{900}$
" " Hydrocyanic Acid,		....	....	7	7
" " Muscarine,		....	....	7	....
" " Morphine,		....	....	7	....
" " Pilocarpine,		....	....	7	3
" " Phytolaccine,		....	....	7	....
" " Physostigmine,		....	....	7	....
" " Quinine,		....	....	7	$\frac{1}{25}$
Bromal Hydrate and Atropine,		....	....	7	1$\frac{1}{4}$
Chloral and Atropine,		....	....	$\frac{1}{900}$	7
" " Picrotoxin,		....	....	7	7
" " Physostigmine,		....	....	7	....
" " Strychnine,		....	....	7	$\frac{1}{25}$
Chloroform and Amyl Nitrite,		....	....	7	....
Digitalin and Aconitine,		7	$\frac{1}{300}$	7	....
" " Muscarine,		....	....	....	$\frac{1}{288}$
" " Saponin,		....	....	....	$\frac{1}{900}$
Gelsemium and Opium,		....	....	....	....
" " Atropine,		$\frac{9}{56}$	$\frac{1}{20}$	$\frac{1}{6}$	$\frac{1}{20}$
Morphine and Caffeine,		3	$\frac{3}{7}$	3	7
" " Chloroform,		$\frac{1}{3}$	....	$\frac{1}{3}$	1$\frac{3}{4}$
Muscarine and Atropine,		....	....	....	....
Opium and Atropine,		....	....	....	....
" " Gelsemium,		....	....	....	7
" " Veratrum Viride,		....	....	....	7

Anthelmintics (ἀντι, against, ἕλμινς, a worm),—are agents which destroy (vermicides) or expel (vermifuges) worms inhabiting the intestinal canal. The principal vermifuges are the purgatives Castor Oil, Jalap and Scammony; while the vermicides are classed according to the worm they are each most efficient against, thus,—

Thread Worms (*Oxyuris Vermicularis*).	*Round Worms* (*Ascaris Lumbricoides*).	*Tape Worms* (*Teniæ, etc.*).
Alum.	Santonica.	Aspidium.
Sulphate of Iron.	Santonin.	Kamala.
Lime Water.	Spigelia.	Kousso.
Quassia.	Chenopodium.	Granatum.
Eucalyptol.	Senna } with the	Pelletierine.
Sodium Chloride.	Calomel } above.	Pepo.
Tannin.	Naphthalene.	Turpentine.
Veg. Astringents.	Papain.	Chloroform.
Naphthalene.		Naphthalene.

The substances enumerated in the first column are all used locally by enema. *Adjuncts* to these remedies are such agents as prevent the excessive secretion of intestinal mucus, which affords a nidus for the worms Such are Bitter Tonics and preparations of Iron, also Ammonium Chloride and Sodium Chloride. *Thymol* is specific against the hook-worm (ankylostomum duodenale).

Antidotes (*ἀντί*, against, *δίδωμι*, I give),—are agents which affect a poison either physically or chemically, or both, so as to remove it from the body or alter its character by forming with it an insoluble or inert compound before its absorption, with the object of *preventing* its toxic action upon the organism. Antidotes do their work in the alimentary canal or in the respiratory passages, and are applicable to vegetable as well as mineral poisons, but are not available against poisons administered hypodermically. They include sundry chemical substances, also measures of various kinds, and may be divided into two classes: (1) *Chemical* or *True Antidotes*, which unite chemically with the poison, converting a soluble and absorbable substance into a compound which is more or less insoluble and non-absorbable, or harmless though soluble; (2) *Mechanical Antidotes* or *Antidotal Measures*, which include such medicinal or mechanical processes as tend to remove a poison from the body, either before or after the use of an antidote; and include emesis, the use of the stomach-pump, purgation, etc. The term *Antidotal Treatment* covers the employment of both antidotes and antidotal measures, and is often used in a still wider sense, namely, to mean all the treatment of a case of poisoning, including the use of Antagonists as well as that of Antidotes. [Compare ANTAGONISTS.]

Thus, *Tannic Acid* is the antidote for poisoning by *Digitalis*, as it forms with the active toxic principles of the drug chemical compounds (tannates) which are almost insoluble and therefore comparatively harmless. But as these tannates are not entirely inert, an antidotal measure, evacuation of the stomach, must also be employed, by the administration of *Zinc Sulphate* or any other emetic, or by the use of a stomach-pump.

Antiperiodics are remedies which affect certain periodical febrile diseases, lessening the severity of their paroxysms or preventing their return. They act probably by arresting the development in the blood of successive crops of pathogenic organisms, upon which the disorders are supposed to depend. The principal antiperiodics are—

Cinchona Bark and its alkaloids, especially Quinine.	Arsenic.
Bebeeru Bark and its alkaloid Berberine.	Eucalyptol.
Salicin, Salicylic Acid, Salicylates.	Iodine.
Opium and its alkaloid, Narcotine.	

Quinine is the most powerful antiperiodic and *Arsenic* ranks next in order of efficiency.

Antiphlogistics (*ἀντί*, against, *φλογίζω*, I burn),—are measures and medicines which are supposed to have some specific power in reducing inflammation. The term is becoming obsolete, but frequent references are still seen to the influence of *Mercury* and *Opium* in inflammations of serous membranes, *Antimony* and *Aconite* in inflammations of the respiratory tract and organs, and to the power of *Veratrum Viride* over puerperal metritis. The chief antiphlogistics are—

Aconite. Opium.	Digitalis.	Venesection.
Veratrum Viride.	Ergot.	Local Depletion.
Tartar Emetic.	Ipecacuanha.	Purgation.
Mercury.	Potassium Nitrate.	Counter-irritation.
Gelsemium.	Rest (recumbent position).	Cold (locally).

Antipyretics (*ἀντί*, against, *πυρετὸς*, fever),—are agents or measures which reduce the body-temperature when abnormally high. This may be done by two principal methods, and the agents doing either accomplish the result by five different actions, as follows, viz.—

(*a*) *Lessening the Production of Heat, by*..
1. Diminishing tissue-change.
2. Reducing the circulation.

(*b*) *Promoting the Loss of Heat, by*.....
3. Dilating the cutaneous vessels, and producing increased radiation.
4. Producing perspiration, and its evaporation.
5. Abstracting heat from the body.

The following list contains nearly all the antipyretics, the numbers following each referring to its proper method of action, as enumerated above:—

Quinine.[1]	Salicylic Acid.[1]	Acetphenetidin.[1,4]
Quinidine.[1]	Sodium Salicylate.[1,4]	Chinolin.[1]
Cinchonine.[1]	Quinine Salicylate.[1]	Resorcinol.[1]
Cinchonidine.[1]	Methyl Salicylate.[1]	Kairin.[1,4]
Berberine.[1]	(Oil of Gaultheria.)	Kairolin.[1,4]
Benzoic Acid.[1]	Trimethylamin.[2]	Hydroquinon.[1]
Phenol.[1,3]	Salol.[1]	Thallin.[1,4]
Picric Acid.[1]	Acetanilide.[1,4]	Pyrocatechin.[1]
Salicin.[1]	Antipyrine.[1,4]	Pheno-resorcin.[1]
Eucalyptol.[1]	Antimonials.[2,4]	Nitrous Ether.[3,4]
Thymol.[1]	Veratrine.[2]	Dover's Powder.[4]
Other Essential Oils.[1]	Colchicum.[2]	Cold Bath.[5]
Alcohol.[1,3]	Leeching.[2]	Cold Drinks.[5]
Digitalis.[2]	Cupping.[2]	Ice to Surface.[5]
Aconite.[2]	Blistering.[2]	Cold Sponging.[5]
Camphor.[1]	Poulticing.[2]	Wet Packing.[5]

Purgation and Venesection produce antipyretic results, but their mode of action is doubtful (Brunton). The Body-temperature is raised by *Belladonna* (or Atropine) and by *Cocaine*, but not to such a degree as to constitute fever or enable them to be classed as pyretics *Tuberculin*, various albumoses, and certain animal poisons, as that of shell fish, will also produce a rise of temperature.

Antiseptics and Disinfectants. Antiseptics, (*ἀντί*, against, *σήψις*, putrefaction), are agents which arrest the development of the micro-organisms which produce decomposition. In stronger solutions than those required for their antiseptic action, most of the antiseptics are germicidal and are therefore disinfectants; while all disinfectants are antiseptics. The chief antiseptics are

named in the following list, the figures giving the minimum strength of their effective solutions, though these figures cannot be applied to all bacteria and their spores indiscriminately:—

Mercuric Chloride, 1 : 50,000	Zinc Chloride, 1 : 500
Mercuric Iodide, 1 : 40,000	Phenol, 1 : 333
Formaldehyde, 1 : 25,000	Alcohol (absolute), 1 : 333
Silver Nitrate, 1 : 12,500	Potassium Permanganate, 1 : 300
Aluminum Acetate, 1 : 6,000	Acetic Acid, 1 : 250
Creolin, 1 : 5,000	Alum, 1 : 222
Chlorine, 1 : 4,000	Ferrous Sulphate, 1 : 200
Creosote, 1 : 3,000	Coffee (freshly roasted), 1 : 200
Naphthol, 1 : 3,000	Arsenic Trioxide, 1 : 166
Copper Sulphate, 1 : 2,000	Boric Acid, 1 : 143
Pyoktanin, 1 : 2,000	Hydrated Chloral, 1 : 107
Bromine, 1 : 1,666	Resorcinol, 1 : 100
Thymol, 1 : 1,500	Antipyrine, 1 : 25
Salicylic Acid, 1 : 1,500	Calcium Chloride, 1 : 25
Eucalyptol, 1 : 1000	Zinc Sulphate, 1 : 20
Hydrogen Dioxide, 1 : 1,000	Sodium Borate, 1 : 14
Calcium Hypochlorite, 1 : 1,000	Potassium Bromide, 1 : 10
Trikresol, 1 : 1,000	Potassium Iodide, 1 : 10
Benzoic Acid, 1 : 900	Ammonium Chloride, 1 : 9
Sulphuric Acid, 1 : 800	Sodium Chloride, 1 : 6
Quinine Sulphate, 1 : 800	Glycerin, 1 : 4

The best antiseptics for surgical use are those which act sufficiently on micro-organisms without injuring or irritating the tissues. The *Mercuric Salts* are very poisonous. *Chlorine*, *Bromine*, and *Iodine* are too irritant. *Benzoyl-acetyl Peroxide*, though actively germicidal, has no antiseptic power, on account of its proneness to break up in the presence of organic substances (Novy). *Salol* is of little value itself, but the products of its decomposition in the intestines are active germicides, and it is one of the best intestinal antiseptics (Wood). *Benzoic Acid* and *Naphthol* are good intestinal antiseptics, but complete asepsis in this situation is impossible.

Disinfectants are agents which destroy the specific germs of infectious diseases. Many antiseptics do not possess germicidal power, and therefore are not disinfectants; but all disinfectants are antiseptics. Disinfectants act in several ways, some as oxidizants, others by combining with albumin, others by chemical combination forming substitution-compounds, others by arresting molecular changes, and still others by altering the reaction of the media containing the germs. The principal disinfectants are named in the following list, the figures following each giving the strength of its aqueous or aërial solution necessary for rapid and certain action:—

Fire, the most efficient.	Chloretone, 1 : 100
Heat, moist, at 212° F.	Calcium Hypochlorite, 1 : 100
Heat, dry, at 302° F.	Eucalyptol, 1 : 100
Benzoyl-acetyl Peroxide, 1 : 1,000	Creolin, 1 : 100
Mercuric Chloride, 1 : 1,000	Lysol, 1 : 100
Iodine, 1 : 500	Trikresol, 1 : 50
Bromine, 1 : 500	Phenol, 1 : 33
Benzoic Acid, 1 : 250	Sulphurous Acid, 1 : 25
Salicylic Acid, 1 : 200	Liq. Sodæ Chlorinatæ, 1 : 20
Formaldehyde, 1 : 100	Ferrous Sulphate, 1 · 20
Hydrogen Dioxide, 1 : 100	Acetic Acid, 1 : 14
Potassium Permanganate, 1 : 100	Lime, fresh, 1 : 4
Chlorine, 1 : 100	Zinc Chloride, 1 : 2

Many good disinfectants are not available by reason of cost or some side action, as Hydrogen Dioxide, Bromine, Iodine, Potassium Permanganate. *Formaldehyde* is the best

surface disinfectant, but has slight penetrating power. It has the advantage of being non-toxic and not retarded in action by albuminoid matter. *Sulphurous Acid* is of very doubtful value, even when present to the extent of 10 per cent. in moist air (Koch). *Chlorine* is used rather as a deodorant than a disinfectant, its germicidal power being uncertain (Munson). *Burnett's Fluid* is a 50 per cent. solution of Zinc Chloride, and equivalent to the official Liquor Zinci Chloridi. *Labarraque's Solution* is the same as the official Liquor Sodæ Chlorinatæ. Both these preparations depend for their efficacy upon the amount of free chlorine which they give out. *Condy's fluid* is a 2 per cent. aqueous solution of Potassium Permanganate; and though a good antiseptic and deodorant, it is practically useless as a disinfectant, being constantly expended in oxidizing the organic matter of the infective substance, and would be required in enormous and impracticable quantities (Davies).

The popular idea of disinfecting *the air* of a room by burning sulphur, etc., is an absurdity, because foul air is easily removed by simple ventilation. In disinfecting a room in which there has been a case of contagious or infectious disease, the true aim is to kill the germs contained in the dust on ledges, in the crevices between the boards, or adhering to the walls, and a dry gas is powerless for this purpose, which is best accomplished by using a *Corrosive Sublimate Solution* of the strength of 1 in 1000; or by *Lime* washing, provided that the lime be freshly burnt, and caustic; or by spraying with *Formalin*, or by dropping the latter on hot plates or sheets of hot metal.

Antispasmodics (*ἀντί*, against, *σπασμός*, a spasm),—are agents which prevent or allay spasm of voluntary or involuntary muscles in any portion of the organism. Some of the agents belonging to this class act by tonic stimulation of the higher nervous centres, the coordinating power, and the circulation; as Alcohol and Ether in small doses, Camphor, Musk, Valerian: others by a depressant influence on the motor centres, as the Bromides; and still others by paralysis of the end-organs of the vaso-motor nerves, as Amyl Nitrite. A few depress all the vital functions, as Aconite, Tobacco, Lobelia, Hellebore, and Prussic Acid; and a number stimulate the muscular fibres of the intestines to expel gaseous accumulations, namely—Asafetida, Cajuput, Valerian, Musk, Aromatic Oils, etc. They are used in convulsive affections, especially asthma and other spasmodic diseases of the respiratory organs, hysteria, chorea, angina pectoris, epilepsy, etc. The principal antispasmodics are named in the following list:—

Alcohol. Ether.	Aconite.	Ammoniac
Paraldehyde.	Lobelia.	Castor.
Chloroform.	Tobacco.	Musk.
Amyl Nitrite.	Hellebore.	Galbanum.
Nitrites.	Opium.	Sumbul.
Bromides.	Belladonna.	Ipecacuanha.
Potassium Iodide.	Stramonium.	Senega.
Potassium Nitrate.	Hyoscyamus.	Silver Salts.
Arsenic.	Hydrocyanic Acid.	Zinc Salts.
Valerian.	Physostigma.	Copper Salts.
Conium.	Curare.	Asafetida.

Antizymotics (*ἀντί*, against, *ζυμωσίς*, fermentation),—are agents which arrest the fermentative processes, the action of these depending on unorganized ferments (enzymes), as diastase, ptyalin, pepsin, etc., or upon that of organized ferments, as the yeast-plant, bacteria, etc. The Antizymotics are usually subdivided into two groups, respectively entitled Antiseptics and Disinfectants (which see).

Fermentation is a general name for those processes of decomposition, during which certain carbon compounds called *Ferments* act upon other carbon compounds, as on their

food,—splitting these latter up, setting free their elementary constituents, and thereby leading to the formation of still other carbon compounds, by the rearrangement of the freed molecules. These processes are of two kinds, viz.:—

(1)—Those in which water is taken up, (hydration),—chiefly carried on by enzymes.

(2)—Those in which O is transferred from the H to the C association, as in lactic and alcoholic fermentation, and the putrefactive processes, which are chiefly carried on by the agency of organized ferments.

The Ferments producing these fermentative changes are also carbon compounds, and are divisible into two groups, viz.:—

Enzymes, or *Organic Ferments*,—have no definite structures, and are unorganized, *i. e.*, not living,—as Diastase, Ptyalin, Pepsin, etc.

Organized Ferments,—are minute, living organisms, as the moulds, yeast-plant, bacteria, and other members of the Protophytes, the lowermost class of plants, which, in the course of their life history, split up the carbon compounds in which they live, appropriating some part of their elements.

Antizymotic Drugs are drugs which arrest or inhibit these fermentative processes either by destroying or by rendering inactive the causative ferments.

Aphrodisiacs (*Ἀφροδίτη*, Venus),—are medicines which stimulate the sexual appetite and power. They act by reflex or by direct action upon either the cerebral or the spinal genital centre. Tonics are indirectly aphrodisiac, as are all measures which promote the general bodily nutrition. The chief agents used as direct aphrodisiacs are named in the following list. [Compare ANAPHRODISIACS.]

Strychnine.	Cimicifuga.	Ergot.
Cannabis.	Serpentaria.	Iron.
Cantharis.	Sanguinaria.	Alcohol.
Phosphorus.	Opium (at first).	Bitter Tonics.
Aurum.	Camphor (at first).	Flagellation.
Yohimbine.	Damiana (?).	Meat Diet.

Strychnine acts by increasing general nutrition and exalting the reflex excitability of the genital centres. *Hemp* probably only causes a mild delirium which may or may not take a sexual direction. *Cantharides* acts by direct irritation of the mucous lining of the urethra, and is dangerous in aphrodisiac doses. *Alcohol* in small doses excites the genital centre in the brain; so also *Opium* and *Camphor*, the latter being decidedly anaphrodisiac after a time. The power of *Damiana* is doubtful. *Urtication* and *Flagellation* of the nates produce priapism by irritation of the genital centre in the cord through the sensory nerves of the part. *Ergot* is considered useful by contracting the dorsal vein of the penis, preventing its emptying too rapidly.

Astringents (*ad*, to, *stringo*, I bind),—are agents which produce contraction of muscular fibre and condensation of other tissues, the first probably by direct irritation, the second by precipitating their albumin and gelatin. They also lessen secretion from mucous membranes. The principal astringents are—

Acids.	Tannic Acid.	Bismuth Subnitrate, etc.
Alcohol.	Gallic Acid.	Cadmium Sulphate.
Alum.	Catechu. Gambir.	Copper Sulphate.
Chalk.	Galls.	Ferric Chloride.
Lime.	Kino.	Lead Acetate.
Creosote.	Oak-bark.	Silver Nitrate.
Phenol.	Uva-Ursi.	Zinc Sulphate.

Sulphuric Acid, Gallic Acid, and Lead Acetate are examples of *Remote Astringents*, acting on internal organs through the blood. Those which affect the part to which they are applied are *Local Astringents*, and include the others named above.

Cardiac Sedatives lessen the force and the frequency of the heart's action. They are used to control palpitation and overaction of that organ, and to slow

the pulse in febrile conditions in sthenic subjects, especially when local inflammation is the exciting cause of the fever. The chief cardiac sedatives are—

Aconite.	Pilocarpine.	Senega, Saponin.
Antimony.	Digitalis.	Hydrocyanic Acid.
Veratrum.	Ouabaïn.	Potassium Salts.
Muscarine.	Emetine.	Cold.
Quinine in full doses.	Chloral.	

Aconite, *Veratrum*, *Muscarine*, *Pilocarpine*, *Saponin* and *Hydrocyanic Acid*, are direct cardiac poisons, depressing the heart muscle and the cardiac motor ganglia; *Muscarine* and *Pilocarpine* also stimulate the inhibitory ganglia. *Digitalis* stimulates the vagus centre and the cardiac muscle, and acts as a sedative in many cases by slowing the cardiac rate and giving it a regular rhythm. *Aconite* is said by some authorities to relax inhibition, by others to stimulate the vagus centre. *Antimony* depresses the motor ganglia, *Potassium* depresses the cardiac muscle.

Cardiac Stimulants rapidly increase the force and frequency of the pulse in depressed conditions of the cardiac apparatus. One of the most useful agents of this class is *Alcohol* in some form, its action being largely due to a reflex influence excited through the nerves of the mouth and stomach. It should therefore be given in but slightly diluted form, and in small quantities frequently. *Ether* is next in value and still more rapid in action, and the local application of *Heat* is one of the most powerful and available. *Ammonia* has an energetic action as a stimulant to the vaso-motor centre, as well as a reflex one upon the heart similar to that of Alcohol. The chief cardiac stimulants are—

Adrenalin.	Hydrastinine.	Sparteine.
Alcohol.	Cocaine.	Camphor.
Ammonia	Ether. Chloroform.	Aromatic Oils.
Atropine.	Heat (locally).	Turpentine.
Nitroglycerin.	Continuous Galvanic Current.	Opium and Morphine, in
Spermine.	Counter-irritation.	small doses.

Cardiac Tonics, when given in moderate doses, stimulate the cardiac muscle, slowing and strengthening its contractions. In large doses they are apt to produce irregular action of the heart, and some of them have more or less of a tendency to cause sudden death by syncope if pushed to any great extent. The most important of these agents are—

Digitalis.	Squill.	Strophanthus.
Convallaria.	Erythrophlœin.	Strychnine.
Cimicifuga.	Caffeine.	Helleboreïn.
Sparteine.	Saponin.	Adonidin.

Digitalis acts partly by stimulation of the vagus end-organs in the heart, thus increasing cardiac inhibition, and partly by direct stimulation of the cardiac centre in the medulla, as well as by a direct influence on the heart muscle itself. It contracts the aterioles and raises the blood-pressure greatly. *Convallaria*, *Erythrophlœin*, *Squill*, and *Cimicifuga* act similarly but less powerfully, and are correspondingly safer. *Strophanthus* is still better, as it does not affect the vessels, and therefore does not raise the blood-pressure.

Carminatives (*carmino*, I soothe),—promote the expulsion of gas from the stomach and intestines by increasing peristalsis, stimulating the circulation, and relaxing the cardiac and pyloric orifices of the stomach. They also act as diffusible stimulants, both of the bodily and mental faculties. The principal