In the neighborhood of them there is a space lined with a sharp layer of epithelial cells which might be interpreted as an arrest of development of a stage like Graf Spee's v. H. On the outside of the pedicle, however, there is a distinct layer of epithelial cells, which brings this specimen in harmony with the others described above. My interpretation of this specimen is a partial formation of the amnion with most of the ecto-

FIG. 1880.

FIG. 1881.

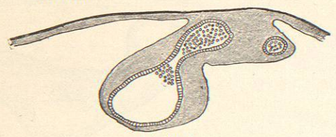

FIG. 1882.

FIGS. 1880, 1881, and 1882.—The Sections through the Vesicle and Chorion of No. LXXVIII. × 10 times. Blood within the cavity of the vesicle. The stem is partly covered with epithelium and there is a double amnion, shown in Fig. 1880.

derm on the outside of the vesicle. A similar condition is found in specimen LXXVIII., Figs. 1880–1882. Here again there is an epithelial layer around the periphery of the stem with a double amnion lined with high epithelium just beneath it (Fig. 1880). There are also blood islands in the mesoderm of the pedicle. Much more marked than any of the above is the condition found in XXIV., Figs. 1883–1885. We have here an ectoderm of varying thickness covering a large share of the vesicle, dipping into the depth at numerous points to produce solid plugs as well as invaginations. There are also numerous epithelial tubes within the pedicle which do not

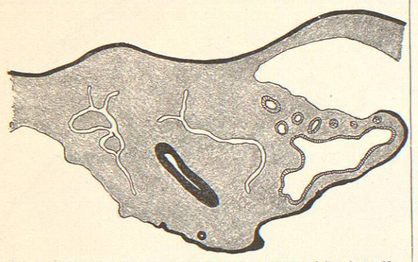

FIG. 1883.—Section through the Vesicle and Chorion of Specimen No. XXIV. × 25 times. There are a multiple allantois and multiple amnion with a thick layer of epithelium over the vesicle.

communicate with the outer epithelial layer. In this specimen we again have multiple amnion made intelligible from all of the specimens just described.

In addition to the specimen in which the amnion is either partial or multiple, we have in XIV., Figs. 1886 and 1887, a specimen without any amnion whatever. The vesicle is covered with a layer of epithelial cells (ectoderm) which has fallen off in part. There are a few

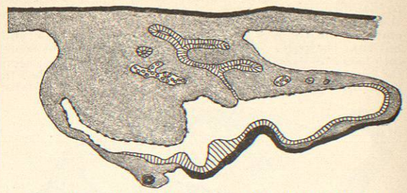

FIG. 1884.—Deeper Section through No. XXIV., showing the Branching Allantois.

blood islands present. There are also two spaces in the chorion which do not communicate with the main cavity of the vesicle and they are lined with a layer of thin cells. These may be remnants of the amnion, but their appearance differs so from the amnion in other specimens that I am not inclined to accept such an explanation. Below them, embedded in the chorion, there is a nest of syncytial cells.

With the hypothesis that the epithelial covering of the vesicle and the epithelial tubes in the stem are derived from the ectoderm, all of these pathological specimens of the vesicular form can be explained. I have constantly compared them with numerous sets of serial sections of normal umbilical vesicles of all ages, and have never found this epithelial covering of the umbilical vesicle of the normal embryo like that in the pathological. In one instance the umbilical vesicle of a pathological embryo of the fourth week (XCVII.) is covered with a layer of epithelial cells.

While we have all variations in the growth of the ectodermal covering of the vesicle, we also have variation in

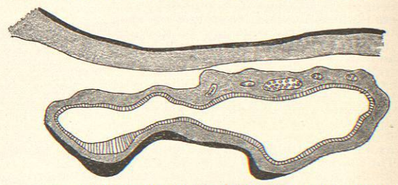

FIG. 1885.—A Deeper Section of the Vesicle, showing the Irregular Thickening of the Ectoderm and Entoderm.

the growth of its entodermal lining. In general, there is a tendency for the pedicle of the vesicle to become destroyed, thus liberating the vesicle from the chorion. Hand-in-hand with this process there is an arrest of the development of the allantois. Usually there is none. My inclination is to consider the cavity in the pedicles of XIV. and XXI., Fig. 1886, as the allantois which has been separated from the umbilical vesicle. Yet this is only an opinion. In specimen LXXVIII. the cavity of the umbilical vesicle extends well into the chorion (Fig. 1882), and this condition may be viewed as dilatation of the allantois. In specimen XXIV., Figs. 1883, 1884, with the multiple amnion, we also have a multiple allantois. Its branches subdivide many times, as the figures show.

In all the pathological specimens there are blood islands in the pedicle. This fact establishes the meaning of the vesicle. It is the remnant of the embryo and its umbilical vesicle. From it the blood-vessels grow to the cho-

rion, and in all the pathological specimens of vesicular form they do not reach it. The same statement applies to all ova in which the embryo was destroyed at an early

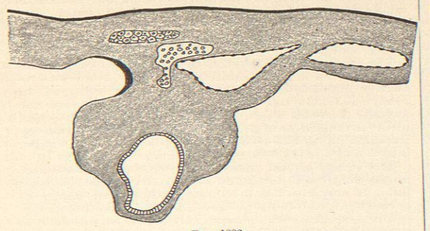

FIG. 1886.

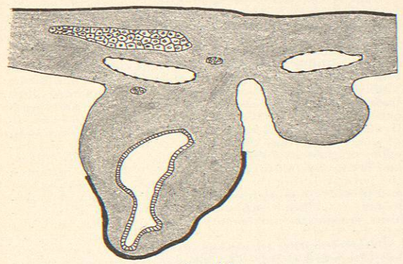

FIG. 1887.

FIGS. 1886 and 1887.—Section through the Nodule (Vesicle) of Specimen No. XIV. × 25 times. A few blood islands are within the stem as well as an enclosed mass of syncytium. These are also still in the chorion. The nodule is covered with a layer of epithelium which has fallen off at points.

date. If the embryo is fairly well formed before it started to disintegrate, there are blood-vessels with or without blood in the chorion.

What I have called umbilical vesicle is undoubtedly, in some instances, what Giacomini calls amnion in his earlier communications. The presence of blood-vessels is the main evidence for my calling these vesicles umbili-

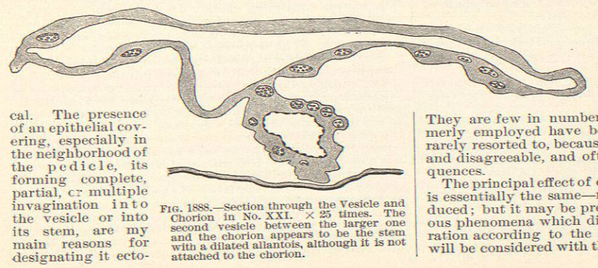

FIG. 1888.—Section through the Vesicle and Chorion in No. XXI. × 25 times. The second vesicle between the larger one and the chorion appears to be the stem with a dilated allantois, although it is not attached to the chorion.

cal. The presence of an epithelial covering, especially in the neighborhood of the pedicle, its forming complete, partial, or multiple invagination into the vesicle or into its stem, are my main reasons for designating it ecto-dermal. Other observations, enumerated above, also speak for this interpretation.

A single vesicle just separated from the chorion is found in No. CXXIII., Fig. 1889. This vesicle is completely separated from the chorion with its pointed end opposite a pointed mound within the chorion showing its original connection. A similar vesicle is in specimen CXXX., but the communication may have broken off. Another specimen of the same kind is CXLVII. The vesicle is fully separated from the chorion and is partly covered with a very thick mesoderm in which are blood-vessels filled with blood. There are blood-vessels in the chorion in the immediate neighborhood of the vesicle, showing that at one time the vesicle must have been connected with it.

A unique specimen is shown in No. CXLIII. There are two large vesicles which do not communicate and are

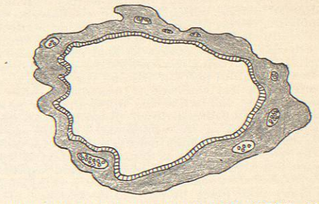

FIG. 1889.—Section through the Vesicle of No. CXXIII. × 25 times. Entoderm, mesoderm, and blood islands are shown.

connected with the chorion. The structure of their walls could not be made out, as the specimen had been in alcohol many years. The vesicles seem to represent the amnion and umbilical vesicle.

The primary affection in the vesicular forms seems to be in the neighborhood of the pedicle. At this point all the forces come together. Through it the blood-vessels meet the chorion. Into it the amnion and allantois grow. So it is natural that forces which overthrow the development of an early embryo must express themselves at this point.

Franklin P. Mall.

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EMETICS are medicines used to produce vomiting. They are few in number. Some of the medicines formerly employed have become obsolete, and others are rarely resorted to, because their emetic operation is harsh and disagreeable, and often followed by injurious consequences.

The principal effect of emetics, the process of vomiting, is essentially the same—no difference by what means induced; but it may be preceded and followed by numerous phenomena which differ greatly in intensity and duration according to the agent used. These phenomena will be considered with the individual emetics. Here we

may profitably study the common effect of emetics, the act of vomiting.

In order that vomiting may take place, certain muscles, whose action is consecutive in the normal state, must contract simultaneously. The efferent impulses coordinating their movements come from the medulla oblongata, and are held to start in the emetic centre, which is closely related to the respiratory centre, but is doubtless more extensive. When this centre becomes excited in consequence of the action of a medicine, or of a morbid state of other organs, such as the stomach, uterus, peritoneum, meninges, cerebrum, etc., or of the blood, as in uræmia, efferent impulses pass from it to the various muscles whose simultaneous contraction is necessary in order that vomiting may take place.

However induced, by medicines or by pathological states, the process of vomiting usually begins with nausea and a flow of saliva, which is partly swallowed, often with much air. Soon retching takes place, an ineffectual effort to vomit, in which a strong inspiratory effort is made while the glottis is closed, so that no air can enter the lungs. The air being drawn into the pharynx, some of it is swallowed and helps to distend the stomach, thus facilitating the act of vomiting. Immediately after the inspiratory effort, and while the diaphragm is powerfully contracted and forced down toward the stomach, a strong contraction of the abdominal muscles occurs. Since the diaphragm remains contracted and the glottis closed, the whole force of this expiratory effort is spent in pressure upon the abdominal organs, and especially upon the distended stomach. Sometimes several successive retchings take place before the contraction of the abdominal walls becomes so powerful as to cause the ejectment of the contents of the stomach. When this latter happens the cardiac orifice of the stomach is widely dilated, which is supposed to be effected by contraction of the longitudinal muscular fibres of the œsophagus, especially those which pass from the end of the œsophagus over the stomach, but which more probably results from the diminution of the intrathoracic pressure necessarily following the powerful inspiratory effort while the glottis is closed. The intense action of the abdominal muscles, which causes the expulsion of the contents of the stomach, is quickly succeeded by a sudden and powerful expiration, which prevents the vomit from entering the glottis, and ejects mucus or other pathological products which may be present in the air passages.

During the contraction of the abdominal muscles the circulation of blood in the abdominal vessels is interrupted, and hence the vessels of the face, neck, conjunctiva, and probably of the brain, become distended.

The mode of action of most emetics is doubtful. Of one only, apomorphine, is it clearly proved that it acts on the emetic centre. Of ipecacuanha and tartar emetic it is not yet fully established how they act, whether on the emetic centre or on the gastric nerves, or both. It is generally held that sulphate of zinc, sulphate of copper, mustard, and alum act on the gastric nerves, though some authors hold that sulphate of zinc and sulphate of copper may also act on the emetic centre.

According to the supposed action of emetics, they have been divided into two groups: direct and indirect. Those supposed to act on the gastric nerves have been called direct emetics, and sometimes local, mechanical, or irritant emetics. The indirect emetics, which are supposed to act on the emetic centre, have also been called systemic emetics.

Apomorphinæ Hydrochloras.—The emetic action of this salt was observed by its discoverers, Wright and Matthiessen, in experiments, but Gee first investigated its operation on man. Numerous careful experiments on man and animals have been made since the discovery of its emetic power (1869), so that its mode of action and the incidental phenomena preceding and following its operation have been clearly elucidated.

It produces vomiting by acting on the emetic centre. This is evident from the fact that when injected into the subcutaneous tissue it acts more speedily, certainly, and in smaller doses than when given internally. That its operation does not result from elimination through the gastric mucous membrane is proved by the fact that intravenous injection is followed by vomiting in animals whose aorta has been previously ligated, so that no apomorphine can be conveyed to the stomach.

Apomorphine, in appropriate doses, acts speedily, certainly, and gently.

The time elapsing between the subcutaneous injection and the first act of vomiting may vary from two to twenty minutes, but it rarely exceeds ten minutes. In twelve careful observations by Riegel and Boehm the average time was nine and a half minutes after injection of the average dose of gr. $\frac{1}{6}$. In six other observations by the same physicians vomiting took place, on the average, in five and a half minutes after average doses of gr. $\frac{1}{8}$.

The emetic action takes place with great certainty, unless the dose is too small or too large, when it may fail. It may also fail in certain pathological states, especially in profound sopor produced by narcotics, and in severe dyspnœa with cyanosis. In these conditions it is supposed that the emetic centre is so greatly depressed that apomorphine cannot excite it.

Usually the action of apomorphine is gentle, and attended by slight incidental phenomena. Sometimes the vomiting occurs quite suddenly and unexpectedly, with very little effort, and without having been preceded by notable nausea or other symptoms. More frequently the act of vomiting is preceded for a short time, usually several minutes, by such phenomena as are incidental to the vomiting process however induced. There occurs slight nausea, with giddiness, ringing of the ears, and headache. Frequently there takes place a copious flow of saliva, with free perspiration. The patient may complain of some præcordial distress; or he may yawn, and become languid and sleepy. Retching soon takes place, and is rapidly followed by vomiting. In rare instances the patient during the period of nausea becomes restless, and presents motor disorder, such as rhythmical movements of the head, supination and pronation of the forearms, spasmodic movements of the lower jaw, and hiccup.

Before vomiting ensues the pulse becomes accelerated, but afterward slow. The blood pressure, according to Harnack, does not become increased, from which it is inferred that the frequent pulse results from excitation of the accelerator nerves. In some patients very little or no change in the pulse rate is observable. The respirations become rapid and superficial before vomiting, and afterward slow.

The act of vomiting, after an ordinary dose of apomorphine, may occur but once, or be repeated several times, occasionally from four to eight times. It is usually quick and easy if the stomach is distended, but preceded by ineffectual retching if the stomach is empty. Between the acts of vomiting, when they occur several times, the patient feels weak, yawns occasionally, and sweats freely. Sometimes copious salivation takes place. The nausea continues, often with eructations and retching. After the last act of vomiting nausea may persist for a short time; the patient is much relaxed, and usually very sleepy. The depression is rarely intense.

All the symptoms produced by apomorphine wholly disappear, as a rule, in from thirty minutes to two hours.

In young children appropriate doses generally cause vomiting very rapidly, the time elapsing between the injection and the first act of vomiting varying from three to seven minutes (Jurasz). In from one to three minutes the child exhibits evidences of its action. Usually it becomes more quiet, yawns occasionally, grows pale, and has a staring look. Infants not rarely present symptoms of depression; the head droops, the extremities become cool and powerless, the face very pale, the pulse feeble, and the general appearance resembles that of narcotic poisoning. According to Jurasz, these phenomena soon vanish after the cessation of vomiting. Then the child still perspires freely, and has a copious flow of saliva, but soon becomes sleepy, and usually goes to sleep. After several hours of rest it awakes fully restored to its ordinary condition. Thus the effects produced by apomorphine in infants are marked by greater depression than in adults. This is supposed to be due, not to a specific action of the medicine, but to the nausea, for which infants have great susceptibility and little endurance.

Sometimes alarming depression has followed moderate doses in adults. Thus gr. $\frac{1}{4}$ caused intense collapse in a strong man (Dujardin-Beaumetz). In the case of an old man gr. $\frac{1}{12}$ failed to produce emesis, but caused agitation, dimness of sight, small pulse, yawning, copious flow of saliva, and somnolency (Moeller). After doses of gr. $\frac{1}{60}$ to gr. $\frac{1}{15}$ a woman had repeated attacks of syncope, with alternating myosis and mydriasis, and convulsive twitchings of the corners of the mouth (Prévost). In young children appropriate doses sometimes produce spasmodic movements of the head, extremities, jaws, and diaphragm, with hyperæsthesia (Jurasz).

Excessive doses may fail to produce vomiting, and be followed by alarming symptoms, although generally they are not followed by severer symptoms than moderate doses. Professor Pecholier, after an injection of nearly gr. $\frac{1}{2}$, had ineffectual retchings, then suddenly became unconscious, and ceased to breathe. After another injection he vomited, and fell into a state of profound collapse, from which he was rescued by hypodermatic injections of ether and the application of sinapisms.

Apomorphine is appropriate in all cases indicating the use of an emetic. It should be employed whenever a speedy evacuation of the stomach is necessary, as in cases of poisoning, and when the stomach is inflamed, and hence liable to be injured by the irritant emetics. It is specially indicated when patients are unable or unwilling to swallow, as in trismus and insanity.

Apomorphine is administered hypodermatically. It never produces notable irritation, even when concentrated solutions are injected.

According to Jurasz and other observers, the following doses are suitable for children: From birth to three months, gr. $\frac{1}{120}$ to $\frac{1}{80}$; three months to one year, gr. $\frac{1}{80}$ to $\frac{1}{40}$; one year to five years, gr. $\frac{1}{40}$ to $\frac{1}{30}$; five years to ten years, gr. $\frac{1}{30}$ to $\frac{1}{12}$. For adults the dose varies from gr. $\frac{1}{12}$ to $\frac{1}{3}$. Females and weakly males require somewhat smaller doses, from gr. $\frac{1}{15}$ to $\frac{1}{4}$.

Generally one-per-cent. solutions are employed for adults, and one-half-per-cent. for children. The solution rapidly becomes green, but retains the emetic property for a long time. It is a good rule to remain with the patient for some time after the injection has been made, in order to apply restoratives should inordinate depression result.

Ipecacuanha.—As an emetic ipecacuanha is characterized by slowness and mildness of action. Its activity is due to the presence of an alkaloid, called emetine, which it contains in greatly varying quantities. Podwyssotzki found in the best kinds of ipecacuanha from three-fourths to one per cent. of emetine, and in the poorest only from one-fourth to one-half per cent.

The mode of action of emetine is doubtful. Most authors incline to the view that it results from an irritant action upon the peripheral termination of the vagus nerve in the stomach, because it acts, when given internally, in smaller doses than when injected subcutaneously, and just as rapidly, and because it has been discovered in the vomit after subcutaneous injection. Others hold that it acts on the emetic centre, because it causes vomiting after all modes of administration, internal, subcutaneous, intravenous, etc.; and because they failed to detect it in the vomit or any secretion or excretion after subcutaneous or intravenous injection (Podwyssotzki).

Ipecacuanha, or its active principle, emetine, acts slowly even when maximum doses are given. Rarely does vomiting occur before twenty minutes after doses of one scruple, and usually not before thirty minutes. Emesis results in about the same time after subcutaneous injections of emetine. When small or moderate doses of ipecacuanha are administered, vomiting may be delayed for a longer time. Thus Ackermann, in trials with ten-grain doses given at intervals of fifteen minutes, found that vomiting occurred in three-quarters of an hour. Sometimes, however, very small doses, two to five grains, act in twenty or thirty minutes. This is due in part to the varying quantities of the active principle, but more generally to the notable susceptibility of some persons to its action.

Even in very large doses ipecacuanha always acts mildly, the act of vomiting occurring but once or twice. Doubtless this is due to the expulsion of the greater part of the emetine before it can act upon the gastric nerves or become absorbed; for in animals, after subcutaneous injections of large doses of emetine, the act of vomiting is repeated three or four times at long intervals.

The incidental phenomena are usually slight. Sometimes the nausea is decided, and attended by marked general relaxation; and there may occur a copious flow of saliva, free perspiration, giddiness, shudderings, rapid pulse, eructations, and repeated retching before the act of vomiting; but these phenomena quickly subside afterward, the patient remaining only weak and sleepy for some time. Sometimes looseness of the bowels occurs, especially if the emetic operation is much delayed.

The quantity of ipecacuanha required to produce vomiting varies greatly—in some patients one or two grains sufficing, in others less than twenty or thirty grains not succeeding. Emetine usually acts in doses of one-twelfth to one-sixth of a grain. According to Husemann it more frequently than ipecacuanha causes loose stools.

Ipecacuanha may be employed in all cases requiring emetics, if speedy action be not necessary. It has usually been preferred to other medicines when irritating substances, such as indigestible articles of food, required removal, or when accumulations of mucus in the bronchial tubes were impeding the respiratory process. On account of its gentle action it is especially suitable for feeble, old, and very young patients.

For adults the dose of ipecacuanha varies from ten to twenty grains, repeated at intervals of ten or fifteen minutes until vomiting occurs. Generally it is given in the form of powder, mixed with an equal quantity of sugar. For very feeble patients the wine is preferable, which may be given to adults in doses of half an ounce. Large draughts of tepid water, taken as soon as nausea begins, hasten the emetic operation. To infants and young children the syrup of ipecacuanha is usually administered in doses of half a drachm to two drachms every ten minutes until vomiting results.

Antimonii et Potassii Tartras.—Tartar emetic is noted for severity of action, and hence is rarely employed except in combination with ipecacuanha.

Small doses act slowly. In careful trials, Ackermann found that half a grain, repeated at intervals of fifteen minutes, produced vomiting in one hour and three-quarters. But doses of one or two grains frequently operate within fifteen minutes. Often purgation follows, especially when the vomiting takes place slowly.

The incidental symptoms are very pronounced. They consist of intense nausea, profound muscular relaxation, pallor of the face, shudderings, free perspiration, giddiness, copious salivation, distress in the epigastrium, eructations, and severe, often violent, and frequently repeated, retching. The act of vomiting is usually repeated a number of times, at intervals of various length. Sometimes it occurs so often, and is attended by such severe nausea and retching as to cause profound collapse, marked by deathly pallor, sunken features, superficial breathing, and weak thready pulse.

Most authorities hold that tartar emetic produces vomiting by acting on the gastric nerves. The fact that it causes vomiting when injected into a vein, or into the connective tissue, does not prove that it acts on the emetic centre, for the quantity required to produce vomiting when thus administered is larger than the internal dose, and it acts more slowly. Besides, the medicine may be detected in the vomit after subcutaneous or intravenous injection, and hence comes into close relation with the

nerves of the stomach. When tartar emetic is given internally, the greater part is discharged with the vomit, and the part retained or absorbed is insufficient to cause emesis when injected into a vein.

There exist no special indications for the use of tartar emetic. Formerly, when it was supposed to exert a controlling influence over inflammatory affections, it was often given at first in emetic doses. But this practice is now obsolete. It should never be administered to very young children, to aged or weakly patients, on account of the profound collapse which it may induce.

The hyperemesis which sometimes results from tartar emetic may be allayed by giving small pieces of ice with a few drops of chloroform. The following remedies are also useful: strong coffee, tannic acid, ether, wine, alcohol, morphine, and tincture of opium.

The dose of tartar emetic for adults is from half a grain to one grain, repeated twice if necessary. It is usually combined with ipecacuanha: ℞ Antimonii et potassii tartratis, gr. ij.; pulv. ipecacuanhæ, ʒi. M. Div. in partes æquales, iv. Sig.: One powder every ten minutes until vomiting takes place.

Zinci Sulphas.—This salt, in suitable doses, produces vomiting promptly, energetically, and with little nausea. In some instances it also causes colicky pain and liquid stools.

According to the observations of Toulmouche, vomiting rarely occurs after the administration of two grains, inconstantly after four grains, almost always after six to twelve grains, and only in one-third of the cases after fifteen grains. Liquid stools occur in one-half of the cases after four to twelve grains, and in two-thirds of the cases after fifteen grains.

Sometimes, however, it operates in doses of one scruple to half a drachm, almost as soon as it reaches the stomach, causing a single but copious ejectment.

On account of its rapid action and the absence of notable nausea, sulphate of zinc is adapted to cases requiring speedy evacuation of the stomach. Hence it is usually employed in narcotic poisoning.

To adults it is given in doses of six to twelve grains, repeated, if necessary, every ten minutes until vomiting ensues. ℞ Zinci sulphatis, amyli, āā ʒss. M. Div. in partes æquales iij. Sig.: One powder every ten minutes until vomiting is induced.

Cupri Sulphas.—This salt, like the sulphate of zinc, usually acts promptly and without marked nausea. Its emetic action is also frequently followed by colic and liquid stools.

While the action of sulphate of copper is generally rapid, occurring soon after administration, it is sometimes quite slow. Thus Ackermann found that five-grain doses, administered every fifteen minutes, caused vomiting in one hour. Formerly, when sulphate of copper was used as an emetic in the early stage of phthisis, it was frequently observed that its operation was delayed for more than half an hour (Thompson).

Sulphate of copper is preferable to other emetics in poisoning with phosphorus, because it possesses antidotal properties. It gradually becomes reduced by the phosphorus, and then covers the phosphorus with a layer of metallic copper, and thus prevents its volatilization and absorption (Bamberger).

Sulphate of copper has been especially recommended in croup. If the exudation impeding respiration be loosely attached, the powerful operation of sulphate of copper may cause its expulsion; but it can produce no other effect.

The dose of sulphate of copper for adults is from two to ten grains; for children, from one to five grains, repeated, if necessary, several times at intervals of ten or fifteen minutes. ℞ Cupri sulphatis, ℈i.; pulv. acaciæ, ℈ij. M. Div. in chart. iv. Sig.: One powder every ten minutes until vomiting ensues (in narcotic poisoning). ℞ Cupri sulphatis, gr. vi.; aquæ destill., ʒi.; syrupi, ʒss. M. Sig.: A dessertspoonful every ten minutes until vomiting ensues (in croup).

Sinapis Alba.—Mustard in large doses rapidly induces vomiting. When other emetics and the stomach pump are not at hand, it is employed in poisoning with narcotics. Sometimes it acts promptly when sulphate of zinc has failed. It should not be used when the poison is of such a nature as to produce inflammation of the stomach.

A teaspoonful of mustard flour may be administered in a teacupful of tepid water, and, if necessary, repeated once or twice at intervals of ten minutes.

Alumen.—Alum, in doses of half a drachm to two drachms, produces vomiting in from twenty to forty minutes. Its operation is attended by very little nausea and depression. It has sometimes been employed in croup and in narcotic poisoning. For children the dose is half a drachm administered in syrup, and repeated, if necessary, in half an hour.

General Indications for the Use of Emetics.—Emetics are used to evacuate the stomach, to expel pathological products from the air passages, and to remove foreign bodies lodged in the œsophagus or upper part of the air passages.

1. To evacuate the stomach is the first indication in many cases of poisoning. As it is essential to accomplish this as speedily as possible, only those emetics should be used which act promptly. In poisoning by narcotics, such as morphine, opium, atropine, belladonna, stramonium, etc., one of the following emetics should be selected: apomorphine, sulphate of zinc, sulphate of copper, or mustard. The subcutaneous injection of apomorphine is quickly followed by copious vomiting, if the nervous centres are not greatly depressed. Hence, if a long time has not elapsed since the poison was taken, and profound sopor has not taken place, this emetic should be preferred to all others. But if the patient is so comatose that he cannot be aroused, apomorphine should not be used, as it would probably fail to induce vomiting and would greatly increase the depression.

If some time has elapsed since the poison was taken, vomiting is not readily induced. Then sulphate of zinc and sulphate of copper may fail in ordinary doses; hence some authors recommend very large doses, from twenty to forty grains. It is well to recollect, however, that according to the observations of Toulmouche, doses of fifteen grains and more of sulphate of zinc more frequently fail than doses of six to twelve grains. It should also be recollected that large doses of sulphate of zinc and of sulphate of copper, if they do not cause emesis, produce severe irritation of the intestinal mucous membrane, and, after absorption, depress the central nervous system. If moderate doses do not soon cause vomiting, recourse should be had to mustard flour, which generally acts promptly.

In poisoning with phosphorus, sulphate of copper is preferable to other emetics, as it prevents the volatilization and absorption of the poison.

In poisoning with strychnine or nux vomica, apomorphine is the most suitable emetic. In several instances the spasms produced by strychnine have immediately subsided after a hypodermatic injection of apomorphine.

Apomorphine has been successfully employed in cases of poisoning with oil of bitter almond, with carbolic acid, and with kerosene.

Emetics are contraindicated in poisoning with corrosive substances, such as the concentrated mineral acids and the caustic alkalies.

Whenever emetics are employed in cases of poisoning by vegetable and animal substances, repeated emesis should be produced, as it is not rarely found that the vomit of the third or fourth evacuation gives evidence of the presence of some of the poison. In order to hasten and facilitate the action of the emetic, large quantities of tepid water should be given, and the fauces titillated with the finger or a feather.

Emetics are indicated to evacuate the stomach when indigestible food, or the products of fermentation or putrefaction, cause severe gastric irritation or alarming disorder of the nervous system. Sometimes convulsions in children, a comatose state in adults, intense headache,

and severe cramp-like pain in the stomach, have this origin. If the history of the illness and the general condition of the patient clearly point to this cause, emetics should be used. They usually give speedy relief. The best internal emetic is ipecacuanha, as it produces less irritation of the gastric mucous membrane than sulphate of zinc, sulphate of copper, or mustard. Large quantities of tepid water should be given as soon as nausea supervenes, in order to render the vomiting as easy as possible. A subcutaneous injection of apomorphine is, however, superior to all internal emetics, as it in no wise increases the irritation of the stomach and causes speedy evacuation. Especially should it be preferred to ipecacuanha when convulsions in children are caused by gastric irritation.

2. To expel pathological products from the air passages, emetics are occasionally indicated in bronchitis, bronchiolitis, catarrhal pneumonia, and croup. When respiration is difficult, rapid, and superficial, and moist râles are heard over various parts of the chest, emetics often give decided, although temporary, relief. Apomorphine is preferable to other emetics, as it possesses decided expectorant properties and acts rapidly and gently. It may, however, fail in capillary bronchitis, when the breathing is very difficult and decided cyanosis has taken place. The only internal emetic which should be administered to children to eject accumulations of mucus in the air passages is ipecacuanha. In strong adults this remedy may be combined with tartar emetic.

Emetics are generally resorted to in croup to expel the fibrinous exudation or false membrane. Sometimes they accomplish this, but more frequently fail on account of the firm attachment of the membrane. If the ejectment takes place, a notable amelioration of the dyspnœa immediately occurs. As it is of the highest importance to prevent the depression which so rapidly occurs in croup, only those emetics are eligible which produce slight nausea, such as sulphate of copper, sulphate of zinc, and alum. Apomorphine has been successfully used in some cases, and in the early stage of croup deserves preference to other emetics.

3. Sometimes emetics are indicated when foreign bodies have lodged in the œsophagus and upper part of the air passages. They are useful when the substance lodged in the œsophagus is rounded, doughy, or pulpy, but may be harmful when it is very irregular (pieces of bone, needles, fish bones), as the efforts incident to vomiting may be followed by severe injury of the œsophagus.

When foreign bodies lodge above the glottis, they may be expelled by emetics; but if situated below, vomiting may cause them to lodge in the rima glottidis, especially if they be angular.

Apomorphine should be preferred to all other emetics to remove foreign bodies, as it acts speedily and certainly.

Contraindications.—At the time, now happily past, when it was supposed that the whole course of febrile and inflammatory diseases might be favorably modified by the action of emetics, especially by such as induce severe and prolonged nausea, authors found it necessary to enumerate numerous contraindications, such as inflammation of any of the abdominal organs, diseases of the heart and blood-vessels, great debility, the extremes of life, pregnancy, the presence of hernia, etc. When the presence of a poison in the stomach indicates its rapid evacuation, an emetic must be given regardless of all other considerations, if the stomach pump cannot be used. But in cases of gastric irritation in which life is not imperilled, other less rapid methods of treatment should be instituted, if the operation of vomiting itself endangers the life or future well-being of the patient.

Samuel Nickles.

EMETINE. See *Ipecac.*

EMMENAGOGUES. See *Ecbolics.*

EMODIN. See *Buckthorn* and *Cascara Sagrada.*

EMOLLIENTS (from Latin *emollire*, to soften) are substances which tend to soften, relax, and protect the parts to which they are applied. As a rule they are fatty and have very little, if any, real medicinal activity; but this lack of active medicinal virtue in no way detracts from their therapeutic value. Emollients are "for outward application" only. Substances of a similar kind, but for *internal* use, are called demulcents, and these two terms must be kept distinct. Demulcents are for mucous membranes; emollients for the skin. (See article *Demulcents.*)

Action and Uses.—The action of emollients is almost entirely mechanical; by their moisture and warmth they cause the blood-vessels to dilate, and with relaxation of contractile tissues pressure on the nerves is lessened, and thus the tension and pain in an inflamed part are relieved. Emollients also exert a *protective* influence over inflamed surfaces which would otherwise suffer from friction and even from the oxygen of the air; in cases in which the skin is broken, or the epidermis stripped off, the process of repair can go on without let or hindrance under the protective covering of an emollient. The judicious use of emollients is also responsible for the exclusion of many pathogenic organisms which would otherwise find an easy entrance through a broken skin, and which, having once gained admission, would do more than ordinary harm in tissues whose powers of resistance were already enfeebled. Without emollients wounds, burns, and superficial inflammations would heal but slowly; by emollients the skin is often preserved from cracks, chaps, and fissures, and should these unfortunately supervene emollients are the best remedial agents we have. The application of emollients to those surfaces of the body which come in contact, as the thighs, will lessen the friction and increase the comfort. Emollients also tend to prevent bed-sores and heal blisters; they are also useful in some forms of skin diseases, such as eczema.

List of Emollient Substances.—The chief are: Almond oil, cacao butter, castor oil, cold cream, glycerin, goose grease, lanolin, lard, liniments, linseed oil, neatsfoot oil, olive oil, paraffin, petrolatum, soap, spermaceti, suet, vaseline. Care must be taken to avoid using *rancid* fat or oil, for this would act as an irritant, and do more harm than good. Other substances, as collodion, white of egg, etc., act as *protectives*, but are not emollients. Poultices made of substances retaining heat and moisture are sometimes grouped with emollients, or even regarded as emollients, but they are not rightly included under that heading.

R. J. E. Scott.

EMPHYSEMA OF THE LUNGS.—*Definition.*—Emphysema is the condition in which there is dilatation of the air vesicles with atrophy of the alveolar walls.

Strictly speaking there come under this definition three forms of the disease: Hypertrophic or large-lunged emphysema, atrophic or small-lunged emphysema, sometimes known as senile atrophy, and local or compensatory emphysema. In addition to these forms it is convenient to consider here certain other conditions to which the term emphysema is applied, viz., acute vesicular emphysema and interstitial emphysema.

I. Hypertrophic Emphysema (Syn. *Large-Lunged Emphsema*).—*Morbid Anatomy.*—The lungs are large and distended and do not collapse when the chest is opened. The borders are rounded, encroaching on the heart, sometimes meeting and even overlapping beneath the sternum; the apices project far above the clavicles and the diaphragm is depressed by the voluminous lungs. In color the organs are of a pale gray or grayish-red, and often streaked with lines and spots of pigment. The outlines of the lobules are more distinct than in health, and on close observation the individual air cells appear as clear dilated vesicles reaching the size of small shot or somewhat larger; in occasional instances large thin-walled blebs or bullæ form from the union of smaller vesicles and reach the size of a cherry or walnut. To the feel the organs are soft and downy, they pit on pressure owing to loss