

just the same. In many of his cases constipation appears early in the disease. His plan was to give small doses of castor-oil in milk and clear out the intestines so as to avoid the danger of ulceration from irritation of contents of the tube. If the fecal masses are in the lower part of the colon we can reach them by flushing. This subject has been so frequently discussed at the state meetings and by the public press that it is well known and our patients generally know what to expect and what ought to be done in treating a case of typhoid fever. As regards the diet, there can be no question that milk is the best as a rule, but in some cases it does not agree with the patient and something else must be substituted. In some cases albumin water answers the purpose, in others meat juice. It has been suggested that small doses of calomel are useful during the first week, but his experience had been that the physician is not usually called in until as late as the second week. He inquired of the essayist if he would give calomel in such cases.

DR. J. M. ANDERS, in closing, referred to the statement made that there had been a change of type in the disease during the last decade or two, and said that he was of the same opinion; that the disease had become more mild in type. And yet we still see cases of severe type, and these are taken into consideration in the discussion in his paper. One speaker had expressed himself as being unable to decide whether the improvement was due to hydrotherapy in conjunction with diet and other remedies in modern treatment. His own opinion was that it was due chiefly to hydrotherapy. In cases in which this can not be carried out, the other measures do have special usefulness, and especially a careful dietary. The question had been asked if salol produces any ill effects? He could say that he had never seen a case in which the urine became smoky, although in a few cases it had assumed a pink hue, which generally passed away on diminishing the dose. He had never seen it do any harm. He had not noticed any beneficial effects from salol upon the tendency to relapse. He did not believe that it obviates a tendency to relapse to any appreciable extent. He had not found it to reduce the tendency to other complications, but reliable statistics are wanting on this point. With regard to feeding the patient, he thought it best to be as liberal as possible, however, without at any time exceeding the digestive capacity of the patient, as shown by an examination of the stools. If the stools show undigested material he reduces the food or lengthens the interval. He thought that the stools are not examined sufficiently often by the profession. In some cases it is necessary to examine them microscopically as well as macroscopically. They often show curds and scraps of food still undigested. In this case we may substitute some other form of nourishment. The good effects of the bath are most evident upon the nerve-centers, and the symptoms which proceed from the disturbed organic functions. The reduction of temperature is important, but it is secondary to the effect upon the nervous system of the cold bath. Where hemorrhage from the ulcerated patches occurs the only indication is absolute rest, both local and general. He felt certain, both from his personal experience and from published statistics, that the cold bath has increased the tendency to hemorrhage from the bowels, caused by the necessary disturbance of the patient. The question having been asked if calomel should be given to patients coming under observation late, he would explain that he did not mean that calomel was inadmissible in the later stage, but that the most good was obtained from its use in the first week. At the end of the second week he would not consider it contraindicated unless the patient were very weak, in which case he would prefer to use something less depressing in its effects.

THE INFLUENCE OF OVERCROWDING ON THE PREVALENCE OF TUBERCULOSIS.—That tuberculosis is more prevalent and more destructive where there is overcrowding and necessarily unhygienic conditions is shown by the fact that in Glasgow the death-rate per 100,000 of the population from diseases of the lungs, including tuberculosis, was in one-roomed or two-roomed houses, 985; in three-roomed or four-roomed houses, 689, and in five-roomed houses and upward, 328.

THE UNBROKEN SKIN AS AN ABSORBING MEDIUM.*

THOMAS F. REILLY, M.S., M.D.

MEMBER OF THE NEW YORK STATE MEDICAL ASSOCIATION.
NEW YORK CITY.

In a communication of this kind, consisting, as it largely does, of a review of the works of many observers, much condensation is necessary and many details must be omitted. In reviewing the literature of this subject from the beginning of the century, one is forcibly impressed by the ebb and flow in the popularity of the external application of medicinal agents for their constitutional effects.

Early in the century this method was much in vogue. After 1860, under the inspiration of the experimental physiologists it was relegated to the rear, and for almost a quarter of a century, with the exception of treatises on the use of mercurial inunction in syphilis, there was little written on the subject. Within the past decade the pendulum, largely influenced by the French school of clinicians, has begun to swing to the opposite extreme. The experimental physiologists demonstrated that the lack of homogeneity existing between the various layers of the skin would prevent the entrance of extraneous substances. That theoretic conclusion at first thought seems unanswerable. The crypts of the sebaceous glands, however, are lined with a different kind of epithelium, an epithelium similar in many respects to that of mucous surfaces, and allows the transmission of foreign substances quite as well as if they are brought in contact with it. Another fact demonstrated by later observers, notably Guinard and Linnossier, is that many of the agents that produce therapeutic results by means of cutaneous application are converted into a gaseous state before absorption takes place. The free passage of most gases, particularly oxygen and carbon dioxide, through the skin has been a well-known fact for many years, but it is of quite recent date that the practical application of this principle has obtained. The observers before mentioned clearly proved that when some of the medicinal agents, to be mentioned hereafter, were applied to the skin, without an occlusive dressing, only an infinitesimal amount could be recovered from the urine. If, however, an occlusive dressing of oiled silk and cloth were applied over the substance a very considerable amount could be recovered. This simple principle will account for many of the failures to secure therapeutic results in the past.

Another forward step was taken when Waller and others discovered that many substances, which of themselves could not produce constitutional effects when applied to the skin, might be absorbed if they were dissolved in a volatile substance, such as ether, chloroform or alcohol, which itself is absorbed in a volatile state. The absorption of aqueous solutions of non-volatile bodies by the normal skin is practically impossible. Bartholow's fanciful theory that since the blood is alkaline, acid fluids ought to pass through the skin by a process of osmosis, has not been verified. Non-volatile powders placed on the skin are likewise not absorbed. Guinard made 250 experiments with various substances of this class and never succeeded in finding any trace thereof in the excretions. Whatever absorption takes place in the mineral baths is due to the transmission of the gases evolved and to the presence of

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exposed mucous surfaces, such as the rectum, vagina, etc.

The discussion of absorption by cataphoresis, which is closely related to the subject under consideration, would unduly lengthen this paper, and must be deferred. Vanni and Giucardi believe that substances dissolved in organic liquids are more readily absorbed, and have reported the successful use of morphin and sodium salicylate when dissolved in human saliva. Their results have been disputed by Destot and others. Much had been expected from the inunctions of metals in the colloidal state, but with the exception of silver there has been little encouragement in that direction.

Fats.—A certain proportion of most fats is absorbed. It is taken up almost entirely through the sebaceous glands. Medicinal agents contained in the fatty bases are likewise taken up in varying quantities. To obtain any decided absorption, vigorous and prolonged friction is necessary in order that the substance may come in contact with the glandular epithelium. Fürbinger believes that mercury when used in the form of an inunction, is volatilized in the crypts of the glands, and finds its way into the circulation in the same manner as other gases. The same reasoning might apply to the iodid of potassium. There is, however, sufficient evidence to prove that constitutional effects may be produced by the inunction of non-volatile bodies.

INUNCTION BASES.

Petrolatum.—The value of petrolatum for this purpose is practically nil. This is due to its tendency to gum over the mouths of the glands.

Vasogen.—The trade name for an oxygenated vaselin is one of the latest products of Teutonic genius. It has been highly recommended as an inunction base, but its real value has not yet been determined. Many similar preparations that were lauded to the skies have come and gone. Lard and the various animal and vegetable oils have a moderate penetrating power.

Oleic Acid.—Judging from the literature, it might be supposed that oleic acid had lost much of the popularity that it enjoyed some years ago. It is in extensive use, however, and by many is considered to be the most efficient base for this purpose that we possess. Incompetent pharmacy is responsible for many of the failures attendant on its use.

Adeps Lanæ.—To Oscar Liebreich belongs the credit of calling attention to the old wool-fat, or *œsypus*, and of first demonstrating its exceptional properties as an inunction basis. He showed that wool-fat is a mixture of cholesterin and the fatty acids, which latter, however, must be removed to render the product thoroughly suitable to the skin. He also proved that the fat of the human skin and its sebaceous glands, as well as the vernix caseosa of infants, is essentially identical with wool-fat, being composed of cholesterin and iso-cholesterin. It is derived from the wool-fat of the sheep and has been popularized under the name of lanolin. This is claimed to be a purified *adeps lanæ*, to which water may be added. As watery solutions of certain medicinal agents do not mix well with other fats, this is of a decided advantage, both for incorporation and absorption.

Aubert, as a result of a most thorough and painstaking investigation of the subject, believes that for simple topical application pure lanolin is inferior to other bases, but where friction is employed it is the best basis that we possess. He advises that it be mixed with castor-oil and applied with friction for from five to ten minutes.

Plasters.—It might be expected that there would be a considerable amount of absorption following the application of plasters on account of the length of time they are in a position. Anders believes that the constitutional effects of belladonna may be obtained in this way in children, and that the effect is more continued than when the drug is administered by mouth. The literature on this branch of the subject is very meager.

CONDITIONS FAVORING ABSORPTION.

Bourget found that, after 40 years of age, absorption diminished. It is much more marked in the young. The skin of women is more permeable than that of men. Those of light complexion have more permeable skin than the dark; fat people, more than those with a dry harsh skin.

It had been noticed for a long time that salivation was much more easily produced when mercurial inunction was made over hairy parts, as the pubis, than in other localities. Aubert, after carefully studying this phenomenon, decided that it was due to the increased number of glands and hair follicles present wherein the mercury was more rapidly absorbed. Thus, he produced the effects of pilocarpin by mixing it with lard and then rubbing it into the hairy regions, whereas the effect obtained when applied in other localities was very slight. Those parts of the body covered by thin skin and abundantly supplied with lymphatics, as the axillary and inguinal regions are, must be superior to the more dense structures. Pavolsky advises that the skin be washed with ether to remove oil, filth, etc., before the application of the medicament. Certainly, the parts should be cleansed with soap and warm water beforehand.

INDIVIDUAL APPLICATIONS OF MEDICINES.

A critical review of the literature has elicited the fact that the following agents may be absorbed through the skin and produce constitutional effects.

Mercury.—The first account of the use of mercurial ointment for inunction appears in 1494. Probably the employment of this and other substances by this method is much older. That mercury will produce its effects when administered in this way is generally conceded. The suggestion that the mercury be applied to the sole of the foot and thus rubbed in by the constant movement of the foot in walking is both ingenious and practical, and might be employed in the case of other agents equally as well. By some authorities mercurial soap is preferred to the soap for inunction. It is said to consume less time in its application. Vogel and Bermartzik say that if 1 per cent. sublimate lanolin ointment be rubbed into the skin of the palm of the hand a metallic taste may often be detected in the mouth within a few minutes.

Iodin.—This, either in the form of the tincture or as the iodid, is certainly absorbed. It has been found in the urine by many observers. The iodid has usually been employed in the form of an ointment. Iodid of potassium is decomposed at the body temperature, and in order to secure the full effect an occlusive dressing is necessary. The ordinary tincture when applied should likewise be covered with an occlusive dressing or, what in a measure amounts to the same thing, petrolatum. Elsberg thinks the ordinary tincture too weak and advises a 20 per cent. solution in ether and alcohol. An interesting feature in the absorption of iodid when applied to the skin, is that the amount eliminated by the kidneys and detectable in the urine does not increase gradually but by successive leaps.

Europhen and Iodoform.—Dr. F. Flick asserts that both iodoform and europhen in a solution of cod-liver oil are absorbed by the skin. He has employed these mixtures for nine years and is positive that it produces the constitutional effects of the drugs. Zera J. Lusk has successfully employed an iodoform poultice in seven cases of tuberculous peritonitis. Linnosier has found that considerable amounts of the iodoform may be recovered from the urine following such applications.

Salicylic Acid.—The absorption of salicylic acid is fairly rapid. This may be accounted for by reason of its keratolytic action, and because it is volatile at the body temperature. Reed found that if it be dissolved in alcohol and chloroform, and covered by an impermeable dressing he could detect it in the urine within twenty minutes. Sigalas and Combermalle go even further and assert that when it is rubbed into the skin and covered by a suitable dressing it can be detected in the urine in five minutes. According to Cullen, these authors have succeeded in effecting the absorption of sodium salicylate in the same manner. As might be expected, methyl salicylate, occurring alone or in combination, as in the oil of gaultheria or oil of birch, is readily taken up. Vidal has demonstrated that for this purpose the artificial oil of gaultheria is preferable to the natural oil, in that it contains more of the salicylate and less irritant substances and it does not blister. The ordinary synthetic oil of the shops answers quite as well as the preparations so extensively advertised. This method, either alone or in combination with internal medication, is employed in the treatment of acute articular rheumatism in most of the hospitals of Paris and New York, and gives great satisfaction. I have employed it in the last twelve cases of articular rheumatism and can testify to its efficacy. From one to two teaspoonfuls of the artificial oil are poured on a piece of flannel. Each of the affected joints is encircled by such a dressing and covered with oiled silk, and over this a thick flannel bandage is applied. This procedure is repeated from two to four times daily. Others employ it in ointment form. Lately this plan of treatment has been recommended in the management of acute chorea by Professor Bozzolo, of Turin. It has been suggested that the absence of salicylism, following such application, is due to the slowness of absorption, thus not permitting any great accumulation of the agent in the blood at any one time.

Silver.—The inunction of metallic silver, in the form of unguentum Credé has been successfully employed in many forms of general sepsis. Gustav Shriner reports a number of cases of cerebrospinal meningitis successfully treated by this agent. Credé states that two-thirds of the ointment penetrates the skin, and he has proved this by microscopic sections. Forty-five grains are sufficient in mild cases, and friction should be employed from twenty to thirty minutes. Roswell Park, Marx, Jones, Osborne and others have had excellent results from its use. The literature is quite extensive.

Quinin.—Inglis, Moncorvo and others assert positively that quinin produces its effects when applied locally in the form of an ointment. This method is especially useful in children. Lanolin or oleic acid are the bases usually employed. This means of administering quinin is very popular in and about New Orleans. From personal experience I believe it to be efficacious.

Phenacetin.—A few writers have employed phenacetin in the form of ointment with seeming good results.

Turpentin.—If confined, turpentin certainly does produce its good effects, and this is sometimes painfully evident if the kidneys are diseased.

Guaiacol.—Guaiacol has been used locally with undoubted success in the treatment of the pyrexia of typhoid fever, and tuberculosis. It must be volatilized, and therefore an impermeable dressing is essential.

Creosote.—Fitzgerald, of the English medical service in India, reports twenty-six cases in which creosote in olive-oil was absorbed and lowered the temperature in malarial fever. Gilbert employed it for this purpose in the pyrexia of phthisis with seeming success.

Croton-oil.—Croton-oil, if rubbed on the skin in sufficient quantity, will produce its constitutional effects. A large part of this absorption is due, however, to its preliminary destructive effect on the epidermis.

Ichthyol.—Inasmuch as very little is known of the constitutional effects of ichthyol, we can not say positively that it is absorbed. Lately it has been employed for its constitutional effects in smallpox and measles. It is said to have rapidly reduced the temperature to normal.

Pilocarpin.—This causes a profuse sweating in the parts where it is applied and effects the general condition but slightly. N. S. Davis, Jr., of Chicago, is satisfied that this method of producing diaphoresis is of distinct value in uremia. In a case of my own there was an undoubted increase in the amount of perspiration at first, but it did not continue. The case finally recovered. The usual strength employed was 5 cg. of pilocarpin in adeps lanæ. Effects are not to be expected until three hours have elapsed.

Digitalis.—This is usually employed in the form of a poultice made of the leaves. How it can act unless there be a volatile principle present is not known, but certain it is that many competent observers believe that it produces the effects of the drug on the kidney when administered in this manner.

Belladonna.—There have been many cases of belladonna poisoning reported where large amounts of this agent were employed in this manner. Certainly, the effects of the drug may be obtained by inunction. An ointment of the extract is the preparation most employed. The experiments of Aubert, however, demonstrated that the action of the atropin is largely exerted on the local glands that are covered by the inunction. After the application of an onion or garlic poultice, suitably covered, the odor can be detected in the breath. This volatile principle occasionally appears to exert a favorable influence in the bronchitis of children.

Carbolic Acid.—The effects of carbolic acid are sometimes apparent when large quantities are used as a dressing on the unbroken skin, especially if there be an occlusive dressing applied. This must be due to the transmission of the gas that is evolved and might be avoided by the use of a light permeable dressing.

A large percentage of the practitioners of medicine in this country, I believe are convinced that inunctions of cod-liver oil have some specific value in certain so-called scrofulous conditions, although it would be difficult to prove this in a scientific manner. Drs. Randolph, and A. E. Russel, of Philadelphia, say that they have seen the oil in the feces when rubbed into the skin.

DOSAGE.

It is customary to give the dosage as two or three times that of the same drug when administered by mouth. We can safely quadruple the dosage in most cases, as the absorption is so slow that accumulation

of the medicine in the system in sufficient quantity to be dangerous is hardly possible in that strength.

A medicinal agent to be absorbed by the unbroken skin, must either become volatile during its application, or be incorporated in a fatty base and applied with friction. Occlusion is an absolute requirement in the case of volatile substances. Most of the absorption occurs in the crypts of the sebaceous glands. The effect is much slower, about one-fourth as intense, and longer continued than when the same agent is administered by mouth. A large number of medicinal agents, which when given by mouth are intolerable to many patients, may be administered in this way with scarcely any unpleasant effects.

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 314 West One Hundred and Forty-first Street.

IDIOSYNCRASY AS TO MERCURY.

A CASE OF ERYTHEMA MERCURIALE.*

ALBERT BERNHEIM, M.D.

PHILADELPHIA.

In the history of many a great man, we are told that he had a peculiar aversion to some special thing: be this a cat or a rooster, or a flower or some perfume. In some cases of convalescence, we find special aversion to smoke, even in persons who have been addicted to smoking. Such aversions may be temporary or constant. If the aversion is temporary, we should call it a disposition in consequence of some disturbance in individuality; but if it is constant we may call it a peculiar constitution of individuality, in consequence of

which particular agents operate on the individual in a manner different from their ordinary mode of action on persons in general; briefly, we may call it an idiosyncrasy. Even animals are reported to have idiosyncrasies, thus the horse to the camel.

Idiosyncrasies are not uncommon; they occur in regard to various agents. Perhaps the most frequent ones are those in relation to some foods, such as strawberries, and certain fish. Others are connected with drugs and medicines. A well-known German professor of surgery could not stand iodoform; some can not use carbolic acid; others can not take antipyrin without becoming subjected to an eruption of blisters on many parts of the body.

In the literature on the use of mercury, we do not find so frequent an idiosyncrasy to this drug, and extraordinary effects of it, that it would not be worth while to mention such effects when they do occur, especially when such symptoms incline to simulate phenomena of syphilis, erysipelas and scarlet fever.

If we look over the literature of the 19th century, we do not meet many cases of untoward effects of mercury compared with its numberless uses.

One of the first who wrote about the unexpected effects of mercury was G. Alley,¹ of Dublin, who published, in 1804, in a large treatise, several cases of a peculiar eruption arising from mercury. About the same time, McMullen,² in Edinburgh, described similar cases; Spens³ followed, in 1805, with a description of three cases of erythema mercuriale. They considered the correctness of the name—eczema or erythema. Others again called it erysipelas, and as late as 1887 Dr Kreidmann⁴ discarded the bacteriological origin of erysipelas in favor of medicinal causes, such as mercury.

In 1811, A. Ramsay,⁵ and in 1812 J. Frank⁶ and J. Nicholson⁷ related cases of mercurial erythema. H. Becker⁸ published a treatise, "De Erysepelate Mercuriali," in 1817; B. Kahleis⁹ spoke of mercurial rose in 1823; in 1845 Rambant¹⁰ called attention to purpura hemorrhagica caused by mercury; and Larmande¹¹ wrote about a hydrargyro-atrophic erythema in 1880.

S. Snell¹² described in 1882 a peculiar idiosyncrasy as to mercury. Alexander¹³ related in 1884 a case of acute universal mercurial eczema; a year later Descroizilles¹⁴ wrote on mercurial eczema. P. Gaucherand¹⁵ wrote in 1886 about scarlatiniform skin eruptions caused by internal administration of mercury; Blanc¹⁶ and Kreidmann, in the following year, make observations on mercurial scarlatiniform erythema.

In more recent years, Robinson¹⁷ speaks of an individual who was suffering from two attacks of erythema, one after the other; the first after mercurial inunction, and the second after internal use of calomel. G. Lewin¹⁸ exhibits a case of toxic exanthema caused by quicksilver; and Fordyce¹⁹ mentions a case of desquamative exanthema that had been diagnosed as scarlatina.

Mrs. V. G., 50 years of age, mother of seven children, felt intense itching on her hands and arms in the morning of January 20; the following day she had a rash on her throat, flexor sides of her arms, palms of the hands and flexor sides of her legs; the eruption was the most marked in the hollows of her knees, flexor sides of wrist and elbows. An extensive redness was visible all over the skin of these said parts; the rash consisted of dark-red, small elevations over the level of the skin and felt, to the touching hand, like velvet; the elevations corresponded to the hair-follicles; on January 22 the skin was edematous and hardened like in erysipelas; fever did not exist; urine was abundant, and of a water-

* Presented to the Section on Materia Medica, at the Fifty-first Annual Meeting of the American Medical Association, held at Atlantic City, N. J., June 5-8, 1900.