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SCIENTIFIC AMERICAN SUPPLEMENT

No. 956.

For the Week Ending April 28, 1894.

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CONTAGION IN MILK.

There is a strong tendency on the part of humanity to make facts fit a theory. When a theory has been evolved which seems ingenious and which exemplifies what may be termed the natural unities, even the best trained scientific minds are reluctant to acknowledge its defects. This has gone so far that the highest advance in scientific training has for its result the inculcation of a willingness to abandon theories and of a readiness to yield up preconceived ideas to facts. The germ theory of disease was accepted as a very beautiful one. Soon after its general acceptance what may be termed bacterial analysis was worked up, and the investigator had put within his power the determination of the number of germs in a substance. To analyze a sparkling sample of water or clear piece of ice, and to determine with accuracy the number of germs per cubic centimeter in the apparently pure material, is certainly one of the triumphs of the laboratory. But when to this is added the microscopic examination of individual organisms and their identification as the causes of specific diseases, the way seems open for the perfect prophylaxis of disease, or for its extermination in the discovery of a substance which is poisonous to the disease organism and harmless to the human system.

Many mistakes and wrong assumptions have marked the progress of bacterial investigations. Attempts have been made to determine or rather to specify how many germ centers per cubic centimeter are admissible in drinking water. Investigations on the germs in ice have shown that it often contains large quantities. But the sum of all the work leads to the conclusion that if we are on the threshold of a revolution in sanitary practice, we certainly have not crossed it.

One curious fact has thrown some confusion on the matter. If a large number of bacteria are present in water, *a priori* considerations would pronounce it unhealthy. But it may happen that these bacteria are of a type that cannot exist in contaminated water, and they may be the best possible pledge for its healthfulness.

The bacteriologist works on the system of cultivating the organisms he works on, and as culture medium employs various gelatine solutions. These are found favorable for the growths in question. In our articles of everyday consumption we find in milk what, to a considerable extent, is an ideal culture medium for bacteria. If organisms dangerous or fatal to the human system get into milk, what, in the present aspect of our knowledge, seems a most favorable condition for the propagation of disease is brought about. In milk the dangerous organisms can live and thrive, and the extended use of milk makes it an effective agent of contagion.

In the town of Montclair, N. J., a number of cases of typhoid fever have occurred recently, which appear to be due to contaminated milk. The milkman who supplied the milk lived in a village about three miles distant, and lying on the other side of what is termed the Orange Mountain. This is a hill of trap rock interposing a barrier between the two localities. The drainage of one place is effectively shut off from the other.

A number of weeks before the disease appeared in Montclair there were two cases of typhoid fever in the milkman's family. The milk meanwhile was taken daily to Montclair and sold to the dealer's customers. Recently typhoid fever made its appearance in Montclair, and a number of deaths from this and similar complaints were recorded, most of which were apparently traceable to this milk—at least those affected with typhoid fever were consumers of the milk in question. Besides the deaths there have been a large number of fever cases, and of these very many occurred in families using the milk. One theory holds that the well on the milkman's place had become infected. The bottles in which the milk was delivered were washed with water from this well, and the germs of contagion it is supposed were thus introduced.

Nothing is more difficult than to accurately trace the source of such epidemics as this. If no one was affected except those using the suspected article, the case would appear a conclusive one. But it always or nearly always appears that there are cases which cannot be traced to the suspected source, and these occasion at least some doubt in the matter. A large and prosperous settlement suffers in reputation from such occurrences, often, perhaps generally, quite unjustly. If the trouble can be located, as it is in this case, there is service done to the community, and the physician and sanitarian both can feel that their profession has in a sense achieved a triumph. The location of a trouble is more than half the cure.

In the fever cases at Montclair a high measure of certainty is attainable. In brief, the known typhoid cases all occurred in individuals who had partaken of the milk. The origin of the disease is thus fixed about as certainly as is possible in such cases, and the outbreak so definitely limited may be taken as a tribute to the healthfulness of general local conditions.

At the present day, with modern house sanitation and with good water supply, the community seems safe against the dreadful plagues such as described by Boccaccio and Defoe. The fact that an outbreak such as that at Montclair attracts so much attention is really the best proof of the good hygiene of modern conditions. A little care would seem to almost insure humanity from these dangers. Sterilization of milk is now very extensively practiced, and is carried out in many families.

We have in the SUPPLEMENT published several articles on the subject of sterilization of milk, an operation of the simplest description. It consists of exposing the milk for forty-five minutes to the temperature of live steam at atmospheric pressure. Bottles are conveniently used to contain the fluid. They should be filled with a funnel to keep the necks free from milk, then they should be plugged with cotton, through whose pores it has been found that no germ can penetrate. They are then immersed up to the neck in cold water, which is brought to the boiling point and maintained there for forty-five minutes. They are then removed and set aside to cool. Such milk requires no refrigerator for keeping. Before pouring it out the plug is removed, and it may be well shaken to mix in any cream which has risen. Steam sterilizers are often used, but by the method described any deep cooking utensil will answer the purpose.

It certainly seems that there is no room for alarmists, and that the occurrences, while sad in their effects, are rather tributes to the healthfulness of modern conditions of life, which enable the community to resist the visitations instead of succumbing to them at once in larger numbers.

Sweeping with Compressed Air.

One of the most notable of the present century's small inventions is an air pump for cleaning purposes. A hose pipe charged with air under fifty pounds pressure to the square inch is turned upon the article or room to be cleaned. It is used in precisely the same way as the water and hose for washing purposes. It is far more effective in its result than brooms, beaters or brushes, as it searches out and penetrates every crevice and cleft in woodwork.

This device is at present applied to cleaning cars, but so perfect is its work that it is only a question of time when it will come into use for other purposes. Hotels and large buildings might be swept out and dusted in an incredibly short space of time. Carefully managed, this air pressure would rid the room of every particle of dust, clean furniture, carpets and the heavierarticles of bric-a-brac and ornaments. It would do the work of a dozen people.

It is now in order for some home missionary to invent some simple device that will work an air pump and current for household use. Its introduction would revolutionize housekeeping and solve the heretofore hopeless problem of clean rooms, and will keep furniture covers and carpets. It would be economical, as it would render less service necessary and would save a large portion of the wear and tear of furnishing textiles. In houses where there is hydrant water it would not be at all difficult to attach an air pumping apparatus to the kitchen or bathroom faucet and thus furnish power for every floor.

Some years ago it was said that there would never be an invention that could sweep and dust, but at the present rate of things the problem is practically solved by this simple and easily used device.—*Chicago Dispatch.*

International Exhibitions of 1894.

The year 1894 will be signalized by a remarkable series of international exhibitions. On May 5 the Antwerp Exposition will be opened by the King of the Belgians, and will probably prove to be the largest and most attractive exhibition held in 1894. The World's Exposition at Lyons, held by the authority of the French government, will be opened on April 28. Great preparations have been made to render it a magnificent affair. On May 1 a "Grand International Exposition" will be opened at Madrid. The exposition will be held in a stately building, and most of the European nations will participate. There will also be an international exposition at Vienna, the preparations for which are well under way. The San Francisco Midwinter Fair can certainly take rank as an international exhibition on account of the large number of countries represented—thirty-eight in all. It is a curious fact that after each of the great international expositions a series of international and semi-international fairs are held within a year or two.

Hydrocarbon Fats.

B. Haack has recently demonstrated that by heating the naphthalene hydrocarbons with sulphuric acid and manganese peroxide—whereby ozone is generated—an oxidized product is obtained which, after being purified by distillation in vacuo, yields a refined oil containing 60·8 per cent of matter directly saponifiable by alkalies. Exposed to the air, the product loses this power, and is also decomposed by changes of temperature.

Planet Notes for May.

H. C. WILSON.

Mercury will be at superior conjunction, *i. e.*, behind the sun, May 20, at 9 h. 44 m., central time. During May this planet will be wholly hidden to the eye by the glare of the sun, although it is calculated to reach its greatest brilliancy on the 23d.

Venus will be in good position for observation about 4 o'clock in the morning during May. Her phase will increase from about half to two-thirds during the month, while her brilliancy will diminish in the ratio of 137 to 97 in the same time, because of her recession from the earth. Venus and the waning moon will be in conjunction May 1 at 5 h. 7 m. P. M., central time, and again May 31, at 3 h. P. M.

Mars is also to be observed in the morning. He is about 30° west and 14° south from Venus, in the constellation Capricorn, and will move northeast into Aquarius during May. At the end of the month he will be found about half way between the first magnitude stars Fomalhaut (*α Piscis Austrini*) and Markab (*α Pegasi*). Mars will be in conjunction with the moon March 28, at 2 h. 18 m., central time. Observers in Central and South America may see the planet occulted at this time.

Jupiter and *Neptune* will be too low in the west during the early evening hours for any satisfactory observations during this month. The tables of the satellites are therefore omitted. On Poole Bros.' map for this month, however, the courses of Jupiter and Neptune among the stars are indicated for the six months from April 1 to September 1.

Saturn will be in best position for observation during May, crossing the meridian about 10 o'clock in the first half and 9 o'clock P. M. in the latter half of the month. The rings of Saturn are now pretty well widened out, so that the three parts can be distinguished readily and the Cassini division can be followed all the way around. The elevation of the earth above the plane of the rings is about 12°. Saturn is in the constellation Virgo, about 5° north of the first magnitude star Spica, with which he is almost equal in brightness. A conjunction of the moon and Saturn occurs May 16, at 10 h. 55 m. A. M.

Uranus is also in good position for observation, being at opposition May 3.

The four oldest of the minor planets, Ceres, Pallas, Juno and Vesta, all happen to be in the region of sky covered this month by Poole Bros.' map, and their apparent courses for the next six months are shown in red upon the map. Ceres, Pallas and Vesta have passed the best time for their observation, but will be bright enough to be found without much difficulty during the next three months. Ceres was at opposition March 13. Its brightness will be equal to that of a star of the 7·2 magnitude April 1, 7·5 m. May 1, 7·9 m. June 1, 8·2 m. July 1, 8·5 m. August 1, and 8·8 m. September 1. Pallas was at opposition February 7. Its brightness will be 7·0 m. April 1, 7·6 m. May 1, 8·1 m. June 1, 8·5 m. July 1, 8·8m. August 1, and 9·1 m. September 1. Vesta was at opposition March 10. Its brightness will be 6·5 m. April 1, 6·8 m. May 1, 7·2 m. June 1, 7·5 m. July 1, 7·8 m. August 1 and 7·9 m. September 1. Juno is not so favorably situated. Although she comes to opposition May 7, she is so far from her perihelion, or point of nearest approach to the sun, that she will at brightest be only of the tenth magnitude, and will, therefore, probably not be seen by the amateur.—*Popular Astronomy.*

[FROM THE BRITISH JOURNAL.]

Photographic Notes.

How Long should Prints be Washed?—This, says Herr Liesegang, in the *Archiv*, depends on the manner of washing. He recommends the addition of a substance to the toning and fixing baths, which shall act as an indicator. As such, eosine, in the proportion of 0·02 per cent, has given him the best results. He washes until the red coloration has disappeared from the backs of the prints.

Increasing the Sensitiveness of a Plate.—Mr. P. B. de Laborre says that, to impart a high degree of sensitiveness to a plate, in order, say, to take an instantaneous portrait in the studio, it should be immersed for a minute or two in the following solution:

Bichromate of potassium	2 parts.
Distilled water	100 "

This is said to make the plate more sensitive, and it should then be exposed, without washing, and while still wet.

Blood-Red Tones on Bromide Prints. — According to the Paris *Photographe*, such tones are obtained in the following way: The print, after being fixed and washed, is immersed in a fifteen per cent solution of bichloride of copper. The elimination of the excess of copper salt having then been removed by careful washing, the print is placed for several seconds in a solution of ferrocyanide of potassium (strength not stated), is again thoroughly washed, and then once more passed through a solution of cupric chloride, when the red image is immediately seen to appear.

Washing Albumen Prints. - In the first number of *Das Atelier des Photographen*, which is under the editorship of Dr. Miethe, the latter discusses the experiments of Messrs. Grundy and Haddon on the amounts of silver and sulphur left in albumenized prints at different stages of washing. These he summarizes as follows: 1, ten minutes' washing eliminates all soluble matter; 2, further washing extracts no more sulphur or silver, supposing that all the free silver salt of the print has been converted into the soluble silver hyposulphite. To assure the latter condition, the author recommends fixation in a first hypo bath (forty to fifty grammes of salt in 400 or 500 c. c. of water per sheet), to wash for ten minutes in running water, and then place the prints in a second hypo bath (six to ten grammes of hypo in 150 c. c. of water, per sheet), leave in for at least eight minutes, and finally wash in running water for from ten to fifteen minutes.

Uranium Toning of Platinum Prints.—A writer in the *Photographic Gazette* recommends the prints to be made by the cold-bath process, an addition to the developer being made of ten to twenty per cent of a four per cent solution of bichloride of mercury. This gives a brown image to start with. After fixing with HCl and washing, the following toning bath is applied: Uranium nitrate, 5 parts; potassium ferridcyanide, 1 part; acetic acid, 30 parts; water, 500 parts. The print at first takes a sepia tone, which by prolongation of immersion changes to red. The tone may be arrested at any stage. After toning treat the prints with a solution acidified with acetic acid.

Photo.-Dermatology.—Dr. E. Schiff, of Vienna, has been applying photography to the study of the human skin, and, by the aid of a small incandescent lamp and a metallic reflector, has been able to project on that part of the epidermis undergoing examination a light so strong that by the use of very rapid plates all the details of the texture of the skin, and such small markings as are ordinarily non-apparent and are occasionally present, were obtained. The enlarged positives on matt paper are carefully colored, and the results are said to be of great interest to dermatologists.

The Human Hair Industry in Paris.

From an industrial and artistic point of view, says the *Annales Industrielles*, Paris is the center of the fine manufacture of prepared human hair. Of course the reference here is to woman's hair, for man's hair is worthless for any industrial purpose. Aside from the houses that manufacture exclusively for the export trade, the city numbers about 2,000 hair dressers and 5,000 workmen, about half of whom are engaged in the manufacture properly so called.

The source of supply of the hair may be divided into three categories. The hair of the first category is furnished by foreign countries, India and China being the largest suppliers. This hair is exclusively black and gray, and comes in boxes, carefully packed. In addition to these countries, Italy, Spain, Germany, and Russia supply small quantities. The hair from India and China undergoes quite a lengthy preparation. It is first matched, sorted, and combed and then immersed in a solution of soft soap and carbonate of soda, in order to scour it. Upon coming from this bath, it is united root end to root end and formed into locks that are tied near the roots. It afterward remains to render the hair thin and flexible. To this effect, it is first placed in earthen pans filled with chlorureted water and water mixed with hydrochloric acid, which renders it thin and decolorizes it. Then it is immersed in a solution of soft soap and chlorate of potash, in order to render it less brittle. Finally, a definitive color and shade are given it.

A light or blond shade is obtained with oxygenated water or a saturated solution of carbonate of potash. To dye it black, it is boiled for a few hours in a bath prepared with a decoction of nutgalls or Campeachy wood, in which sulphate of iron is dissolved and into which a little sumac is put, in order to give it a luster and remove the bluish tint peculiar to the hair of the dead. Finally, it is bleached by immersing it several times in baths of oxygenated water to which a few drops of ammonia have been added.

Thus prepared, the Chinese or Hindoo hair is sold to the hair dressers, who work it to their fancy, and afterward sell it at more or less moderate prices.

The finest hair, forming the second category, is that of France, and comprises a variety of shades exceeding a hundred.

The most beautiful is furnished by Limousin, Brittany, Normandy, and Beauce. Some lots are derived from young ladies' boarding schools and from convents. All of this is collected by traveling men called "cutters," who make their circuit along toward spring and visit the villages to gather their crop.

In some localities of Brittany and Auvergne, on certain market days, the damsels who desire to sell their head of hair get up on a cask, undo their hair and allow it to fall over their shoulders. An auction soon begins and every lot, as soon as cut, is delivered to the highest bidder for spot cash.

This product does not pass into the bath, but is simply combed and then scoured with buckwheat flour.

Finally, the third category comprises hair (which, it must be confessed, is classed among the most esteemed) derived from the sorting of combings collected by rag-pickers, who stuff it into bags just as they find it, soiled by dust, felted by water, and adhering to the sweepings of houses, and sell it to small manufacturers, who undertake to utilize it.

Five operations are necessary in order to make a presentable commercial product of this refuse. They are: (1) cleaning by means of sawdust; (2) slow and careful combing upon cards; (3) equalizing, which, starting from the principle that a hair is a conical tube, consists in rolling the hairs between the two hands in order to make start from the mass those that are "head to point" in order to arrange them "head to head;" (4) classification, by which the hair is separated into three lengths, for "switches" and plaits for women and wigs for men; (5) sorting, a manipulation requiring great patience, and consisting in dividing the hair into seven shades and three sizes, that is to say into twenty-one fractions.

If it were not for the rag-picker this industry would not exist. He sells his gatherings to middlemen, who in turn sell them to the small manufacturers at a profit of fifty per cent.

A sensible difference is made in the trade between the hair derived from living persons and that taken from the dead. The latter becomes easier to break, and can be neither curled nor rolled in shape. This is what makes the Chinese and Indian consignments generally considered as greatly inferior, such hair being almost all taken from patients that have died in the hospitals. Moreover, the workmen who scour such hair are very often afflicted with chronic affections, due to the irritation of the nasal mucous membrane through the deposit of hair dust thereon, and have almost always a husky and clouded voice by reason of the deposit of such dust upon the tonsils and larynx. Again, they are exposed to the contagious diseases to which the owners of the hair succumbed. They contract these infallibly, even, if they happen to wound themselves with the combing cards.

Fine California Marble.

Near the base of the Inyo Mountains, in Owens Valley, California, near the lake of the same name, lie what are, perhaps, the largest and most wonderful deposits of marble that have been as yet discovered. It is impossible to describe truthfully these vast deposits of beautifully colored stone.

There is white, black, blue, and yellow in pure colors, purple veined, black and gold, making a grand variety of colored marbles, very beautiful for interior decorations. The white marble is perfectly clear, the grain is fine, very compact, and will stand great pressure; it is a pure dolomite, therefore, and will take on and retain a very fine polish. The first two stories of the Mills building in San Francisco, as well as a greater part of the interior finish of the same, are done in this material. The main entrance to the building shows what may be done in the way of relief with the white marble. The black is almost identical with the Belgium black marble; it is very difficult to distinguish one from the other when polished. The yellow marbles vary from a delicate cream to a dark mottled orange. There are veins of deeper yellow, with fern-like markings similar to moss agate, and it is particularly adapted for furniture and interior decorations.—*Inyo Index.*

An Iron Railway Tunnel.

The completion of one of the largest railway iron tunnels in Great Britain at Glasgow—the Mound North tunnel on the North British line—is noted in *Transport.* The mound is a large artificial earthen embankment made across the bed of the old Nor' lock, and carrying the national gallery and one of the main thoroughfares between the old and new towns, and the work has therefore had to be carried out with great care. At the beginning of the tunneling operations a slight "movement" took place at the national gallery, and cracking was observable here and there throughout the building; but nothing very serious occurred. The new tunnel is in effect a huge cast iron tube 17 ft. 6 in. in diameter, composed of segments 4 ft. long by 18 in. in breadth, bolted together through flanges 7 in. deep and 1⅛ in. thick. In cutting the tunnel the shield system was adopted; the average rate of progress per day being one foot nine inches. The appliances used in the construction of this work will now be removed to the south side of the existing tunnel, where a second single-line tunnel in connection with the Waverley Station improvements is also being pierced.

Cost of Food in Different Countries.

According to some recent statistics on the cost of living, an Englishman spends, on an average, $48 a year for food; a Frenchman, $47; a German, $42; a Spaniard, $33; an Italian, $24; and a Russian, $23. Of meat the Englishman eats 109 pounds a year; the Frenchman, 87; the German, 64; the Italian, 26; and the Russian, 51. Of bread the Englishman consumes 380 pounds; the Frenchman, 540; the German 560; the Spaniard, 480; the Italian, 400; and the Russian, 625