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Diseases Of The Horse

Section 2 of 16

Fundamental Principles of Disease

By Rush Shippen Huidekoper

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SPECIAL REPORT

ON

DISEASES OF THE HORSE

BY

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‘Diseases Of The Horse’ Series

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FUNDAMENTAL PRINCIPLES OF DISEASE.

By RUSH SHIPPEN HUIDEKOPER, M. D., VET.

[Revised by Leonard Pearson, B. S., V. M. D.]

ANIMAL TISSUES.

The nonprofessional reader may regard the animal tissues, which are subject to inflammation, as excessively simple structures, as similar, simple, and fixed in their organization as the joists and boards which frame a house, the bricks and iron coils of pipe which build a furnace, or the stones and mortar which make the support of a great railroad bridge.

Yet while the principles of structure are thus simple, for the general understanding by the student who begins their study the complete appreciation of the shades of variation, which differentiate one tissue from another, which define a sound tendon or a ligament from a fibrous band—the result of disease filling in an old lesion and tying one organ with another—is as complicated as the nicest jointing of Chinese woodwork, the building of a furnace for the most difficult chemical analysis, or the construction of a bridge which will stand for ages and resist any force or weight.

All tissues are composed of certain fundamental and similar elements which are governed by the same rules of life, though at first glance they may appear to be widely different.

These are
(*a*) amorphous substances,
(*b*) fibers, and
(*c*) cells.

(*a*) Amorphous substances may be in liquid form, as in the fluid of the blood, which holds a vast amount of salts and nutritive matter in solution; or they may be in a semiliquid condition, as the plasma which infiltrates the loose meshes of connective tissue and lubricates the surface of some membranes; or they may be in the form of a glue or cement, fastening one structure to another, as a tendon or muscle end to a bone; or, again, they hold similar elements firmly together, as in bone, where they form a stiff matrix which becomes impregnated with lime salts. Amorphous substances, again, form

the protoplasm or nutritive element of cells or the elements of life.

(*b*) Fibers are formed of elements of organic matter which have only a passive function. They can be assimilated to little strings, or cords, tangled one with another like a mass of waste yarn, woven regularly like a cloth, or bound together like a rope.

They are of two kinds—white connective tissue fibers, only slightly extensible, pliable, and very strong, and yellow elastic fibers, elastic, curly, ramified, and very dense.

These fibers once created require the constant presence of fluids around them in order to retain their functional condition, as a piece of harness leather demands continual oiling to keep its strength, but they undergo no change or alteration in their form until destroyed by death.

(*c*) Cells, which may even be regarded as low forms of life, are masses of protoplasm or amorphous living matter, with a nucleus and frequently a nucleolus, which are capable of assimilating nutriment or food, propagating themselves either into others of the same form or into fixed cells of another outward appearance and different function but of the same constitution.

It is simply in the mode of the grouping of these elements that we have the variation in tissues, as

(1) loose connective tissue,
(2) aponeurosis and tendons,
(3) muscles,
(4) cartilage,
(5) bones,
(6) epithelia and endothelia,
(7) nerves.

(1) Loose connective tissue forms the great framework, or scaffolding, of the body, and is found under the skin, between the muscles surrounding the bones and blood vessels, and entering into the structures of almost all the organs. In this the fibers are loosely meshed together like a sponge, leaving spaces in which the nutrient fluid and cells are irregularly distributed.

This tissue we find in the skin, in the spaces between the organs of the body where fat accumulates, and as the framework of all glands.

(2) Aponeurosis and tendons are structures which serve for the termination of muscles and for their contention, and for the attachment of bones together.

In these the fibers are more frequent and dense, and are arranged with regularity, either crossing each other or lying parallel, and here the cells are found in minimum quantity.

(3) In the muscles the cells lie end to end, forming long fibers which have the power of contraction, and the connective tissue is in small quantity, serving the passive purpose of a band around the contractile elements.

(4) In cartilage a mass of firm amorphous substance, with no vascularity and little vitality, forms the bed for the chondroplasts, or cells of this tissue.

(5) Bone differs from the above in having the amorphous matter impregnated with lime salts, which gives it its rigidity and firmness.

(6) Epithelia and endothelia, or the membranes which cover the body and line all its cavities and glands, are made up of single or stratified and multiple layers of cells bound together by a glue of amorphous substance and resting on a layer composed of fibers.

When the membrane serves for secreting or excreting purposes, as in the salivary glands or the kidneys, it is usually simple; when it serves the mechanical purpose of protecting a part, as over the tongue or skin, it is invariably multiple and stratified, the surface wearing away while new cells replace it from beneath.

(7) In nerves, stellate cells are connected by their rays to each other, or to fibers which conduct the nerve impressions, or they act as receptacles, storehouses, and transmitters for them, as the switch-board of a telephone system serves to connect the various wires.

All these tissues are supplied with blood in greater or less quantity. The vascularity depends upon the function which the tissue is called upon to perform.

If this is great, as in the tongue, the lungs, or the sensitive part of the hoof, a large quantity of blood is required; if the labor is a passive one, as in cartilage, the membrane over the withers, or the tendons of the legs, the vessels only reach the periphery, and nutrition is furnished by imbibition of the fluids brought to their surface by the blood vessels.

Blood is brought to the tissues by arterioles, or the small terminations of the arteries, and is carried off from them by the veinlets, or the

commencement of the veins. Between these two systems are small, delicate networks of vessels called capillaries, which subdivide into a veritable lacework so as to reach the neighborhood of every element.

In health the blood passes through these capillaries with a regular current, the red cells or corpuscles floating rapidly in the fluid in the center of the channel, while the white or ameboid cells are attracted to the walls of the vessels and move very slowly.

The supply of blood is regulated by the condition of repose or activity of the tissue, and under normal conditions the outflow exactly compensates the supply.

The caliber of the blood vessels, and consequently the quantity of blood which they carry, is governed by nerves of the sympathetic system in a healthy body with unerring regularity, but in a diseased organ the flow may cease or be greatly augmented. In health a tissue or organ receives its proper quantity of blood; the nutritive elements are extracted for the support of the tissue and for the product, which the function of the organ forms.

The force required in the achievement of this is furnished by combustion of the hydrocarbons and oxygen brought by the arterial blood, then by the veins this same fluid passes off, less its oxygen, loaded with the waste products, which are the result of the worn-out and disintegrated tissues, and of those which have undergone combustion.

The foregoing brief outline indicates the process of nutrition of the tissues.

Hypernutrition, or excessive nutrition of a tissue, may be normal or morbid. If the latter, the tissue becomes congested or inflamed.

CONGESTION.

Congestion is an unnatural accumulation of blood in a part. Excessive accumulation of blood may be normal, as in blushing or in the red face which temporarily follows a violent muscular effort, or, as in the stomach or liver during digestion, or in the lungs after severe work, from which, in the latter case, it is shortly relieved by a little rapid breathing.

The term congestion, however, usually indicates a morbid condition, with more or less lasting effects. Congestion is active or passive. The former is produced by an increased supply of blood to the part, the latter by an

obstacle preventing the escape of blood from the tissue.

In either case there is an increased supply of blood, and as a result increased combustion and augmented nutrition.

ACTIVE CONGESTION.

Active congestion is caused by—

(1) *Functional activity.*—Any organ which is constantly or excessively used is habituated to hold an unusual quantity of blood; the vessels become dilated; if overstrained the walls become weakened, lose their elasticity, and any sudden additional quantity of blood engorges the tissues so that they can not contract, and congestion results.

Example: The lungs of a race horse, after an unusual burst of speed or severe work, in damp weather.

(2) *Irritants.*—Heat and cold, chemical or mechanical. Any of these, by threatening the vitality of a tissue, induce immediately an augmented flow of blood to the part to furnish the means of repair—a hot iron, frostbites, acids, or a blow.

(3) *Nerve influence.*—This may produce congestion either by acting on the part reflexly or as the result of some central nerve disturbance affecting the branch which supplies a given organ.

(4) *Plethora and sanguinary temperament.*—Full-blooded animals are much more predisposed to congestive diseases than those of a lymphatic character or those in an anemic condition.

The circulation in them is forced to all parts with much greater force and in large quantities. A well-bred, full-blooded horse is much more subject to congestive diseases than a common, coarse, or old, worn-out animal.

(5) *Fevers.*—In fever the heart works more actively and forces the current of blood more rapidly; the tissues are weakened, and it requires but a slight local cause at any part to congest the structures already overloaded with blood.

Again, in certain fevers, we find alteration of the blood itself, rendering it less or more fluid, which interferes with its free passage through the vessels and induces a local predisposition to congestion.

(6) *Warm climate and summer heat.*—Warmth of the atmosphere relaxes the

tissues; it demands of the animals less blood to keep up their own body temperature, and the extra quantity accumulates in the blood-vessel system.

It causes sluggishness in the performance of the organic functions, and in this way it induces congestion, especially of the internal organs. So we find founders, congestive colics, and staggers more frequent in summer than in winter.

(7) *Previous congestion.*—Whether the previous congestion of any organ has been a continuous normal one—that is, a repeated functional activity—or has been a morbid temporary overloading, it always leaves the walls of the vessels weakened and more predisposed to recurrent attacks from accidental causes than are perfectly healthy tissues.

Thus a horse which has had a congestion of the lungs from a severe drive is liable to have another attack from even a lesser cause.

The alterations of congestion are distention of the blood vessels, accumulation of the cellular elements of the blood in them, and effusion of a portion of the liquid of the blood into the fibrous tissues which surround the vessels. When the changes produced by congestion are visible, as in the eye, the nostril, the mouth, the genital organs, and on the surface of the body in white or unpigmented animals, the part appears red from the increase of blood; it becomes swollen from the effusion of liquid into the spongelike connective tissues; it is at times more or less hot from the increased combustion; the part is frequently painful to the animal from pressure of the effusion on the nerves, and the function of the tissue is interfered with.

The secretion or excretion of glands may be augmented or diminished. Muscles may be affected with spasms or may be unable to contract.

The eyes and ears may be affected with imaginary sights and sounds.

PASSIVE CONGESTION.

Passive congestion is caused by interference with the return of the current of blood from a part.

Old age and debility weaken the tissues and the force of the circulation, especially in the veins, and retard the movement of the blood.

We then see horses of this class with stocked legs, swelling of the sheath of

the penis or of the milk glands, and of the under surface of the belly. We find them also with effusions of the liquid parts of the blood into the lymph spaces of the posterior extremities and organs of the pelvic cavity.

Tumors or other mechanical obstructions, by pressing on the veins, retard the flow of blood and cause it to back up in distal parts of the body causing passive congestion.

The alterations of passive congestion, as in active congestion, consist of an increased quantity of blood in the vessels and an exudation of its fluid into the tissues surrounding them, but in passive congestion we have a dark, thick blood which has lost its oxygen, instead of the rich, combustible blood rich in oxygen which is found in active congestion.

The termination of congestion is by resolution or inflammation. In the first case, the choked-up blood vessels find an outlet for the excessive quantity of blood and are relieved; the transuded serum or fluid of the blood is reabsorbed, and the part returns almost to its normal condition, with, however, a tendency to weakness predisposing to future trouble of the same kind. In the other case further alterations take place, and we have inflammation.

INFLAMMATION.

(Plates I and II.)

Inflammation is a hypernutrition of a tissue. It is described by Dr. Agnew, the surgeon, as "a double-edged sword, cutting either way for good or for evil."

The increased nutrition may be moderate and cause a growth of new tissue, a simple increase of quantity at first; or it may produce a new growth differing in quality; or it may be so great that, like luxuriant, overgrown weeds, the elements die from their very haste of growth, and we have immediate destruction of the part.

According to the rapidity and intensity of the process of structural changes which takes place in an inflamed tissue, inflammation is described as acute or chronic, with a vast number of intermediate forms.

When the phenomena are marked it is termed sthenic; when less distinct, as the result of a broken-down and feeble constitution in the animal, it is called asthenic.

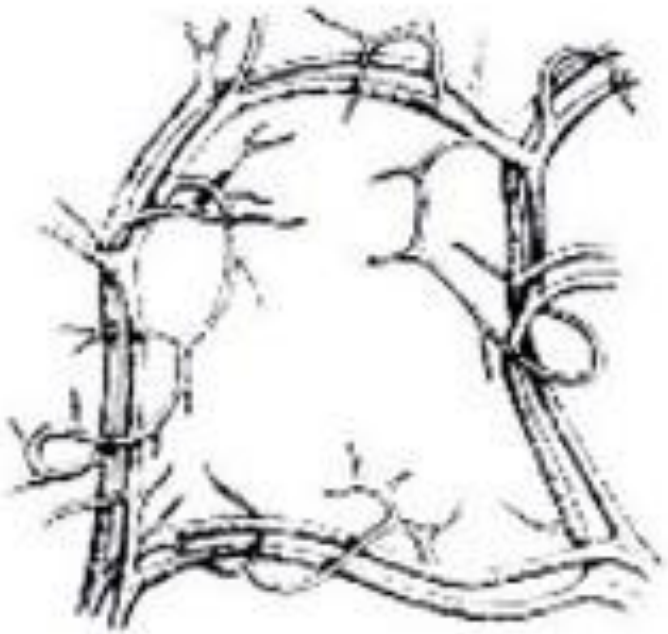
Certain inflammations are specific, as in strangles, the horsepox, glanders, etc., where a characteristic or specific cause or condition is added to the origin, character of phenomena, or alterations which result from an ordinary inflammation.

An inflammation may be circumscribed or limited, as in the abscess on the neck caused by the pressure of a collar, in pneumonia, in glanders, in the small tumors of a splint or a jack; or it may be diffuse, as in severe fistulas of the withers, in an extensive lung fever, in the legs in a case of grease, or in the spavins which affect horses with poorly nourished bones.

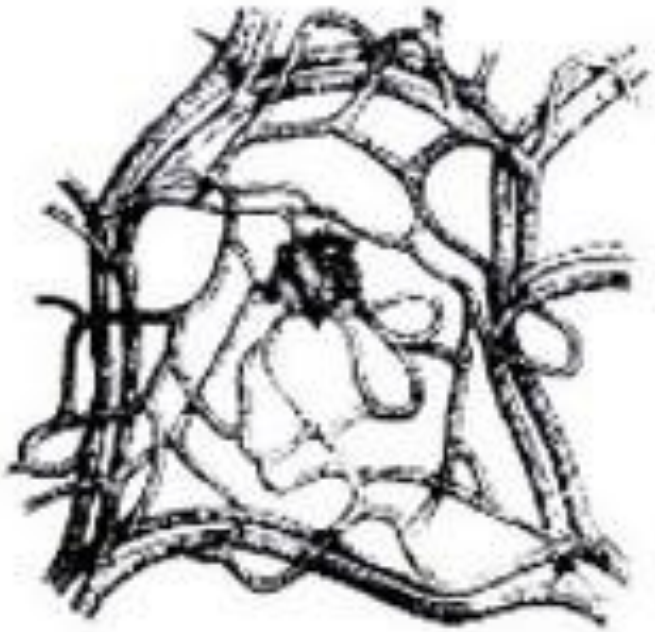
The causes of inflammation are practically the same as those of congestion, which is the initial step of all inflammation.

The temperament of a horse predisposes the animal to inflammation of certain organs.

A full-blooded animal, whose veins show on the surface of the body, and which has a strong, bounding heart pumping large quantities of blood into the vascular organs like the lungs, the intestines, and the laminæ of the feet, is more liable to have pneumonia, congestive colics, and founder, than lymphatic, cold-blooded animals which have pleurisies, inflammation of the bones, spavins, ringbones, inflammation of the glands of the less vascular skin of the extremities, greasy heels, thrush, etc.



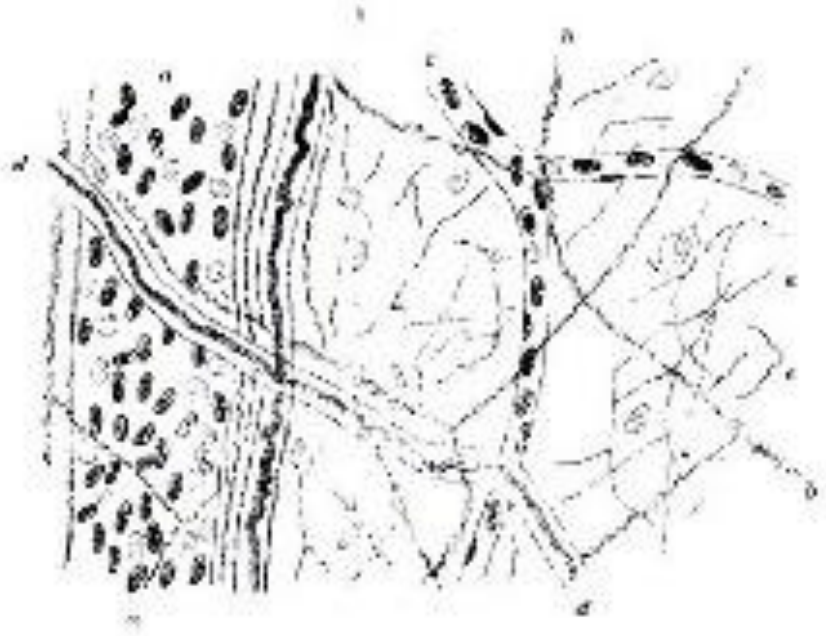
1 Unaffected wing of the bat



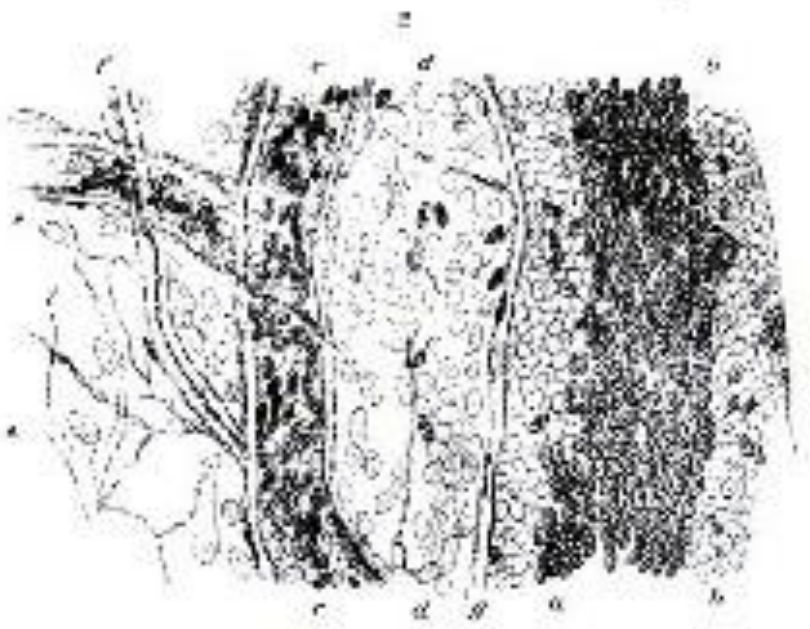
2 Inflamed wing of the bat

PLATE I.

INFLAMMATION.



1.-Non-inflamed mesentery of the frog 400 diameters, reduced ½. a,a, Vessels with red and white corpuscles, b,b, Gelatinous nerve fibre, c Capillary; d, d, Dark-bordered nerve fibre, e,e, Connective tissue with connective tissue corpuscles and leucocytes scattered sparsely through it.



2.-Inflamed mesentery of the frog, 400 diameters, reduced ½. a, b, Vessels filled with red and white corpuscles, the red in the centre and the white crowding along the walls, c, c Capillary distended with red and white corpuscles, number of the white much increased; d, d, Connective tissue between vessels and capillary filled with migrated leucocytes, e, e, Connective tissue with less infiltration, f Dark-bordered nerve fibre, g, Number of nuclei in sheaths increased

PLATE II.

INFLAMMATION.

Young horses have inflammation of the membranes lining the air passages and digestive tract, while older animals are more subject to troubles in the closed serous sacs and in the bones.

The work to which a horse is put (saddle or harness, speed or draft) will influence the predisposition of an animal to inflammatory diseases.

As in congestion, the functional activity of a part is an important factor in localizing this form of disease.

Given a group of horses exposed to the same draft of cold air or other exciting cause of inflammation, the one which has just been eating will be attacked with an inflammation of the bowels; the one that has just been working so as to increase its respiration will have an inflammation of the throat, bronchi, or lungs; the one that has just been using its feet excessively will have a founder or inflammation of the laminæ of the feet.

The direct cause of inflammation is usually an irritant of some form. This may be a pathogenic organism—a disease germ—or it may be mechanical or chemical, external or internal. Cuts, bruises, injuries of any kind, parasites, acids, blisters, heat, cold, secretions, such as an excess of tears over the cheek or urine on the legs, all cause inflammation by direct injury to the part.

Strains or wrenches of joints, ligaments, and tendons cause trouble by laceration of the tissue.

Inflammations of the internal organs are caused by irritants as above, and by sudden cooling of the surface of the animal, which drives the blood to that organ which at the moment is most actively supplied with blood.

This is called repercussion. A horse which has been worked at speed and is breathing rapidly is liable to have pneumonia if suddenly chilled, while an animal which has just been fed is more liable to have a congestive colic if exposed to the same influence, the blood in this case being driven from the exterior to the intestines, while in the former it was driven to the lungs.

Symptoms.—The symptoms of inflammation are, as in congestion, change of color, due to an increased supply of blood; swelling, from the same cause, with the addition of an effusion into the surrounding tissues;

heat, owing to the increased combustion in the part; pain, due to pressure on the nerves, and altered function.

This latter may be augmented or diminished, or first one and then the other. In addition to the local symptoms, inflammation always produces more or less constitutional disturbance or fever.

A splint or small spavin will cause so little fever that it is not appreciable, while a severe spavin, an inflamed joint, or a pneumonia may give rise to a marked fever.

The alterations in an inflamed tissue are first those of congestion, distention of the blood vessels, and exudation of the fluid of the blood into the surrounding fibers, with, however, a more nearly complete stagnation of the blood; fibrin, or lymph, a plastic substance, is thrown out as well, and the cells, which we have seen to be living organisms in themselves, no longer carried in the current of the blood, migrate from the vessels and, finding proper nutriment, proliferate or multiply with greater or lesser rapidity.

The cells which lie dormant in the meshes of the surrounding fibers are awakened into activity by the nutritious lymph which surrounds them, and they also multiply.

Whether the cell in an inflamed part is the white ameboid cell of the blood or the fixed connective tissue embedded in the fibers, it multiplies in the same way.

The nucleus in the center is divided into two, and then each again into two, ad infinitum.

If the process is slow, each new cell may assimilate nourishment and become, like its ancestor, an aid in the formation of new tissues; if, however, the changing takes place rapidly, the brood of young cells have not time to grow or use up the surrounding nourishment, and, but half developed, they die, and we then have destruction of tissue, and pus or matter is formed, a material made up of the imperfect dead elements and the broken-down tissue.

Between the two there is an intermediate form, where we have imperfectly formed tissues, as in "proud flesh," large, soft splints; fungous growths, greasy heels, and thrush.

Whether the inflamed tissue is one like the skin, lungs, or intestines, very

loose in their texture, or a tendon or bone, dense in structure, and comparatively poor in blood vessels, the principle of the process is the same.

The effects, however, and the appearance may be widely different.

After a cut on the face or an exudation into the lungs, the loose tissues and multiple vessels allow the proliferating cells to obtain rich nourishment; absorption can take place readily, and the part regains its normal condition entirely, while a bruise at the heel or at the withers finds a dense, inextensible tissue where the multiplying elements and exuded fluids choke up all communication, and the parts die (necrose) from want of blood and cause a serious quittor, or fistula.

This effect of structure of a part on the same process shows the importance of a perfect knowledge in the study of a local trouble, and the indispensable part which such knowledge plays in judging of the gravity of an inflammatory disease, and in formulating a prognosis or opinion of the final termination of it. It is this which allows the veterinarian, through his knowledge of the intimate structure of a part and the relations of its elements, to judge of the severity of a disease, and to prescribe different modes of treatment in two animals for troubles which, to the less experienced observer, appear to be absolutely identical.

Termination of inflammation.—Like congestion, inflammation may terminate by resolution.

In this case the exuded lymph undergoes chemical change, and the products are absorbed and carried off by the blood vessels and lymphatics, to be thrown out of the body by the kidneys, liver, the glands of the skin, and the other excretory organs. The cells, which have wandered into the neighboring tissues from the blood vessels, gradually disappear or become transformed into fixed cells.

Those which are the result of the tissue cells, wakened into active life, follow the same course.

The vessels themselves contract, and, having resumed their normal caliber, the part apparently reassumes its normal condition; but it is always weakened, and a new inflammation is more liable to reappear in a previously inflamed part than in a sound one.

The alternate termination is necrosis, or mortification. If the necrosis, or death of a part, is gradual, by small stages, each cell losing its vitality after the other in more or less rapid succession, it takes the name of ulceration.

If it occurs in a considerable part at once, it is called gangrene. If this death of the tissues occurs deep in the organism, and the destroyed elements and proliferated and dead cells are inclosed in a cavity, the result of the process is called an abscess.

When it occurs on a surface, it is an ulcer, and an abscess by breaking on the exterior becomes then also an ulcer. Proliferating and dying cells, and the fluid which exudes from an ulcerating surface and the débris of broken-down tissue is known as pus, and the process by which this is formed is known as suppuration.

A mass of dead tissue in a soft part is termed a slough, while the same in bone is called a sequestrum.

Such changes are especially liable to occur when the part becomes infected with microorganisms that have the property of destroying tissue and thus causing the production of pus.

These are known as pyogenic microorganisms. There are also bacilli that are capable of multiplying in tissues and so irritating them as to cause them to die (necrose) without forming pus.

Treatment of inflammation.—The study of the causes and pathological alterations of inflammation has shown the process to be one of hypernutrition, attended by excessive blood supply, so this study will indicate the primary factor to be employed in the treatment of it.

Any agent which will reduce the blood supply and prevent the excessive nutrition of the elements of the part will serve as a remedy.

The means employed may be used locally to the part, or they may be constitutional remedies, which act indirectly.

Local treatment.—Removal of the cause will frequently allow the part to heal at once.

Among causes of inflammation may be mentioned a stone in the frog, causing a traumatic thrush; a badly fitting harness or saddle, causing ulcers of the skin; decomposing manure and urine in a stable, which, by their

vapors, irritate the air tubes and lungs and cause a cough.

Motion stimulates the action of the blood, and thus feeds an inflamed tissue.

This is alike applicable to a diseased point irritated by movement to an inflamed pair of lungs surcharged with blood by the use demanded of them in a working animal, or to an inflamed eye exposed to light, or an inflamed stomach and intestines still further fatigued by feed.

Rest, absolute quiet, a dark stable, and small quantities of easily digested feed will often cure serious inflammatory troubles without further treatment.

The application of ice bags or cold water by bandages, douching with a hose, or irrigation with dripping water, contracts the blood vessels, acts as a sedative to the nerves, and lessens the vitality of a part; it consequently prevents the tissue change which inflammation produces.

Either dry or moist heat acts as a derivative. It quickens the circulation and renders the chemical changes more active in the surrounding parts; it softens the tissues and attracts the current of blood from the inflamed organ; it also promotes the absorption of the effusion and hastens the elimination of the waste products in the part.

Heat may be applied by hand rubbing or active friction and the application of warm coverings (bandages) or by cloths wrung out of warm water; or steaming with warm, moist vapor, medicated or not, will answer the same purpose.

The latter is especially applicable to inflammatory troubles in the air passages.

Local bleeding frequently affords immediate relief by carrying off the excessive blood and draining the effusion which has already occurred.

It affords direct mechanical relief, and, by a stimulation of the part, promotes the chemical changes necessary for bringing the diseased tissues to a healthy condition.

Local blood-letting can be done by scarifying, or making small punctures into the inflamed part, as in the eyelid of an inflamed eye, or into the sheath of the penis, or into the skin of the latter organ when congested, or the leg when acutely swelled.

Counterirritants are used for deep inflammations. They act by bringing the blood to the surface and consequently lessening the blood pressure within.

The derivation of the blood to the exterior diminishes the amount in the internal organs and is often very rapid in its action in relieving a congested lung or liver.

The most common counterirritant is mustard flour.

It is applied as a soft paste mixed with warm water to the under surface of the belly and to the sides, where the skin is comparatively soft and vascular.

Colds in the throat or inflammations at any point demand the treatment applied in the same manner to the belly and sides and not to the throat or on the legs, as so often used. Blisters, iodin, and many other irritants are used in a similar way.

Constitutional treatment in inflammation is designed to reduce the current of blood, which is the fuel for the inflammation in the diseased part, to quiet the patient, and to combat the fever or general effects of the trouble in the system, and to favor the neutralization or elimination of the products of the inflammation.

Reduction of blood is obtained in various ways.

The diminution of the quantity of the blood lessens the amount of pressure on the vessels, and, as a sequel, the volume of it which is carried to the point of inflammation; it diminishes the body temperature or fever; it numbs the nervous system, which plays an important part as a conductor of irritation in diseases.

Blood-letting is the most rapid means, and frequently acts like a charm in relieving a commencing inflammatory trouble.

One must remember, however, that the strength of the body and repair depend on the blood; hence blood-letting should be practiced only in full-blooded, well-nourished animals and in the early stages of the disease.

Cathartics act by drawing off a large quantity of fluid from the blood through the intestines, and have the advantage over the last remedy of removing only the watery and not the formed elements from the circulation.

The blood cells remain, leaving the blood as rich as it was before. Again,

the glands of the intestines are stimulated to excrete much waste matter and other deleterious material which may be acting as a poison in the blood.

Diuretics operate through the kidneys in the same way.

Diaphoretics aid depletion of the blood by pouring water in the form of sweat from the surface of the skin and stimulating the discharge of waste material out of its glands, which has the same effect on the blood pressure.

Antipyretics are remedies to reduce the temperature. This may be accomplished by depressing the center in the brain that controls heat production.

Some coal-tar products are very effective in this way, but they have the disadvantage of depressing the heart, which should always be kept as strong as possible.

If they are used it must be with knowledge of this fact, and it is well to give heart tonics or stimulants with them.

The temperature of the body may be lowered by cold packs or by showering with cold water.

This is a most useful procedure in many diseases.

Depressants are drugs which act on the heart. They slow or weaken the action of this organ and reduce the quantity and force of the current of the blood which is carried to the point of local disease; they lessen the vitality of the animal, and for this reason are now used much less than formerly.

Anodynes quiet the nervous system. Pain in the horse, as in the man, is one of the important factors in the production of fever, and the dulling of the former often prevents, or at least reduces, the latter.

Anodynes produce sleep, so as to rest the patient and allow recuperation for the succeeding struggle of the vitality of the animal against the exhausting drain of the disease.

The diet of an animal suffering from acute inflammation is a factor of the greatest importance.

An overloaded circulation can be starved to a reduced quantity and to a less rich quality of blood by reducing the quantity of feed given to the patient.

Feeds of easy digestion do not tire the already fatigued organs of an animal

with a torpid digestive system. Nourishment will be taken by a suffering brute in the form of slops and cooling drinks when it would be totally refused if offered in its ordinary form, as hard oats or dry hay, requiring the labor of grinding between the teeth and swallowing by the weakened muscles of the jaws and throat.

Tonics and stimulants are remedies which are used to meet special indications, as in the case of a feeble heart, and which enter into the after treatment of inflammatory troubles as well as into the acute stages of them.

They brace up weakened and torpid glands; they stimulate the secretion of the necessary fluids of the body, and hasten the excretion of the waste material produced by the inflammatory process; they regulate the action of a weakened heart; they promote healthy vitality of diseased parts, and aid the chemical changes needed for returning the altered tissues to their normal condition.

FEVERS.

Fever is a general condition of the animal body in which there is an elevation of the animal body temperature, which may be only a degree or two or may be 10° F. The elevation of the body temperature, which represents tissue change or combustion, is accompanied with an acceleration of the heart's action, a quickening of the respiration, and an aberration in the functional activity of the various organs of the body.

These organs may be stimulated to the performance of excessive work, or they may be incapacitated from carrying out their allotted tasks, or, in the course of a fever, the two conditions may both exist, the one succeeding the other. Fever as a disease is usually preceded by chills as an essential symptom.

Fevers are divided into essential fevers and symptomatic fevers.

In symptomatic fever some local disease, usually of an inflammatory character, develops first, and the constitutional febrile phenomena are the result of the primary point of combustion irritating the whole body, either through the nervous system or directly by means of the waste material which is carried into the circulation and through the blood vessels, and is distributed to distal parts.

Essential fevers are those in which there is from the outset a general disturbance of the whole economy.

This may consist of an elementary alteration in the blood or a general change in the constitution of the tissues.

Fevers of the latter class are usually due to some infecting agent and belong, therefore, to the class of infectious diseases.

Essential fevers are subdivided into ephemeral fevers, which last but a short time and terminate by critical phenomena; intermittent fevers, in which there are alterations of exacerbations of the febrile symptoms and remissions, in which the body returns to its normal condition or sometimes to a depressed condition, in which the functions of life are but badly performed; and continued fevers, which include contagious diseases, such as glanders, influenza, etc., the septic diseases, such as pyemia, septicemia, etc., and the eruptive fevers, such as variola, etc.

Whether the cause of the fever has been an injury to the tissues, such as a severe bruise, a broken bone, an inflamed lung, or excessive work, which has surcharged the blood with the waste products of the combustion of the tissues, which were destroyed to produce force, or the toxins of influenza in the blood, or the presence of irritating material, either in the form of living organisms or of their products, as in glanders or tuberculosis—the general train of symptoms are much the same, varying as the amount of the irritant differs in quantity, or when some special quality in them has a specific action on one or another tissue.

There is in fever at first a relaxation of the small blood vessels, which may have been preceded by a contraction of the same if there was a chill, and as a consequence there is an acceleration of the current of the blood.

There is, then, an elevation of the peripheral temperature, followed by a lowering of tension in the arteries and an acceleration in the movement of the heart.

These conditions may be produced by a primary irritation of the nerve centers of the brain from the effects of heat, as is seen in thermic fever, or sunstroke, or by the entrance into the blood stream of disease-producing organisms or their chemical products,

as in anthrax, rinderpest, influenza, etc.

There are times when it is difficult to distinguish between the existence of fever as a disease and a temporary feverish condition which is the result of excessive work.

Like the condition of congestion of the lungs, which is normal up to a certain degree in the lungs of a race horse after a severe race, and morbid when it produces more than temporary phenomena or when it causes distinct lesions, the temperature may rise from physiological causes as much as four degrees, so fever, or, as it is better termed, a feverish condition, may follow any work or other employment of energy in which excessive tissue[Pg 40] change has taken place; but if the consequences are ephemeral, and no recognizable lesion is apparent, it is not considered morbid. This condition, however, may predispose to severe organic disturbance and local inflammations which will cause disease, as an animal in this condition is liable to take cold and develop lung fever or a severe enteritis, if chilled or otherwise exposed.

Fever in all animals is characterized by the same general phenomena, but we find the intensity of the symptoms modified by the species of animals affected, by the races which subdivide the species, by the families which form groups of the races, and by certain conditions in individuals themselves.

For example, a pricked foot in a Thoroughbred may cause intense fever, while the same injury in the foot of a Clydesdale may scarcely cause a visible general symptom.

In the horse, fever produces the following symptoms:

The normal body temperature, which varies from 99° to 100° F., is elevated from 1° to 9°. A temperature of 102° or 103° F. is moderate fever, 104° to 105° F. is high, and 106° F. and over is excessive.

The temperature is accurately measured by means of a clinical thermometer inserted in the rectum.

This elevation of temperature can readily be felt by the hand placed in the mouth of the animal, or in the rectum, and in the cleft between the hind legs.

It is usually appreciable at any point over the surface of the body and in the expired air emitted from the nostrils.

The ears and cannons are often as hot as the rest of the body, but are sometimes cold, which denotes a debility in the circulation and irregular distribution of the blood.

The pulse, which in a healthy horse is felt beating about 42 to 48 times in the minute, is increased to 60, 70, 90, or even 100.

The respirations are increased from 14 or 16 to 24, 30, 36, or even more. With the commencement of a fever the horse usually has diminished appetite, or it may have total loss of appetite if the fever is excessive. There is, however, a vast difference among horses in this regard.

With the same degree of elevation of temperature one horse may lose its appetite entirely, while another, usually of the more common sort, will eat at hay throughout the course of the fever, and will even continue to eat oats or other grains.

Thirst is usually increased, but the animal desires only a small quantity of water at a time, and in most cases of fever a bucket of water should be kept standing before the patient, which may be allowed to drink ad libitum. The skin becomes dry and the hairs stand on end.

Sweating is almost unknown in the early stage of fevers, but frequently occurs later in their course, when an outbreak of warm sweat is often a most favorable symptom.

The mucous membranes, which are most easily examined in the conjunctivæ of the eyes and inside of the mouth, change color if the fever is an acute one; without alteration of blood the mucous membranes become of a rosy or deep-red color at the outset; if the fever is attended with distinct alteration of the blood, as in influenza, and at the end of two or three days in severe cases of pneumonia or other extensive inflammatory troubles the mucous membranes are tinged with yellow, which may even become a deep ocher in color, the result of the decomposition of the blood corpuscles and the freeing of their coloring matter, which acts as a stain.

At the outset of a fever the various glands are checked in their secretions, the salivary glands fail to secrete the saliva, and we find the surface of the tongue and inside of the cheeks dry and covered with a brownish, bad-smelling deposit.

The excretion from the liver and intestinal glands is diminished and produces an inactivity of the digestive organs which causes a constipation.

If this is not remedied at an early period, the undigested material acts as an irritant, and later we may have it followed by an inflammatory process, producing a severe diarrhea.

The excretion from the kidneys is sometimes at first entirely suppressed.

It is always considerably diminished, and what urine is passed is dark in color, undergoes ammoniacal change rapidly, and deposits quantities of salts.

At a later period the diminished excretion may be replaced by an excessive excretion, which aids in carrying off waste products and usually indicates an amelioration of the fever.

While the ears, cannons, and hoofs of a horse suffering from fever are usually found hot, they may frequently alternate from hot to cold, or be much cooler than they normally are.

This latter condition usually indicates great weakness on the part of the circulatory system.

It is of the greatest importance, as an aid in diagnosing the gravity of an attack of fever and as an indication in the selection of its mode of treatment, to recognize the exact cause of a febrile condition in the horse.

In certain cases, in very nervous animals, in which fever is the result of nerve influence, a simple anodyne, or even only quiet with continued care and nursing, will sometimes be sufficient to diminish it.

When fever is the result of local injury, the cure of the cause produces a cessation in the constitutional symptoms.

When it is the result of a pneumonia or other severe parenchymatous inflammation, it usually lasts for a definite time, and subsides with the first improvement of the local trouble, but in these cases we constantly have exacerbations of fever due to secondary inflammatory processes, such as the formation of small abscesses, the development of secondary bronchitis, or the death of a limited quantity of tissue (gangrene).

In specific cases, such as influenza, strangles, and septicemia, there is a definite poison in the blood-vessel system and carried to the heart and to the nervous system, which produces a peculiar irritation, usually lasting for a

specific period, during which the temperature can be but slightly diminished by any remedy.

In cases attended with complications, the diagnosis at times becomes still more difficult, as at the end of a case of influenza which becomes complicated with pneumonia.

The high temperature of the simple inflammatory disease may be grafted on that of the specific trouble, and the determination of the cause of the fever, as between the two, is therefore frequently a difficult matter but an important one, as upon it depends the mode of treatment.

Any animal suffering from fever, whatever the cause, is much more susceptible to attacks of local inflammation, which become complications of the original disease, than are animals in sound health.

In fever we have the tissues and the walls of the blood vessels weakened, we have an increased current of more or less altered blood flowing through the vessels and stagnating in the capillaries, which need but an exciting cause to transform the passive congestion of fever into an active congestion and acute inflammation.

These conditions become still more distinct when the fever is accompanied with a decided deterioration in the blood itself, as is seen in influenza, septicemia, and at the termination of severe pneumonias.

Fever, with its symptoms of increased temperature, acceleration of the pulse, acceleration of respiration, dry skin, diminished secretions, etc., must be considered as an indication of organic disturbance.

This organic disturbance may be the result of local inflammation or other irritants acting through the nerves on nerve centers, alterations of the blood, in which a poison is carried to the nerve centers, or direct irritants to the nerve centers themselves, as in cases of heat stroke, injury to the brain, etc.

The treatment of fever depends upon its cause. One of the important factors in treatment is absolute quiet.

This may be obtained by placing a sick horse in a box stall, away from other animals and extraneous noises and sheltered from excessive light and drafts of air.

Anodynes, belladonna, hyoscyamus, and opium act as antipyretics simply by quieting the nervous system.

As an irritant exists in the blood in most cases of fever, any remedy which will favor the excretion of foreign elements from it will diminish this cause.

We therefore use diaphoretics to stimulate the sweat and excretions from the skin; diuretics to favor the elimination of matter by the kidneys; cholagogues and laxatives to increase the action of the liver and intestines, and to drain from these important organs all the waste material which is aiding to choke up and congest their rich plexuses of blood vessels.

The heart becomes stimulated to increased action at the outset of a fever, but this does not indicate increased strength; on the contrary, it indicates the action of an irritant to the heart that will soon weaken it.

It is, therefore, irrational further to depress the heart by the use of such drugs as aconite.

It is better to strengthen it and to favor the elimination of the substance that is irritating it.

The increased blood pressure throughout the body may be diminished by lessening the quantity of blood.

This is obtained in some cases with advantage when the disease is but starting and the animal is plethoric by direct abstraction of blood, as in bleeding from the jugular or other veins; or by derivatives, such as mustard, turpentine, or blisters applied to the skin; or by setons, which draw to the surface the fluid of the blood, thereby lessening its volume without having the disadvantage of impoverishing the elements of the blood found in bleeding.

In many cases antipyretics given by the mouth and cold applied to the skin are most useful.

When the irritation which is the cause of fever is a specific one, either in the form of bacteria (living organisms), as in glanders, tuberculosis, influenza, septicemia, etc., or in the form of a foreign element, as in rheumatism, gout, hemaglobinuria, and other so-called diseases of nutrition, we employ remedies which have been found to have a direct specific action on them.

Among the specific remedies for various diseases are counted quinin, carbolic acid, salicylic acid, antipyrene, mercury, iodin, the empyreumatic oils, tars, resins, aromatics, sulphur, and a host of other drugs, some of which are

of known effect and others of which are theoretical in action.

Certain remedies, like simple aromatic teas, vegetable acids, such as vinegar, lemon juice, etc., alkalines in the form of salts, sweet spirits of niter, etc., which are household remedies, are always useful, because they act on the excreting organs and ameliorate the effects of fever.

Other remedies, which are to be used to influence the cause of fever, must be selected with judgment and from a thorough knowledge of the nature of the disease.

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