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Systematic feeding of work stock, a preventive of disease, and some of the diseases of farm animals

William Haddock Dalrymple

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LOUISIANA STATE UNIVERSITY AND A. & M. COLLEGE,

AT

BATON ROUGE, LA.

WM. C. STUBBS, PH. D., Director and Official State Chemist.

SYSTEMATIC FEEDING

OF WORK STOCK

A PREVENTIVE OF DISEASE,

—AND—

SOME OF THE DISEASES OF FARM ANIMALS.

BY W. H. DALRYMPLE, VETERINARIAN.

ISSUED BY THE BUREAU OF AGRICULTURE.

T. S. ADAMS, COMMISSIONER.

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BUREAU OF AGRICULTURE.

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OFFICE OF STATE EXPERIMENT STATION,
BATON ROUGE, LA.

Hon. T. S Adams, Commissioner of Agriculture, Baton Rouge, La:

DEAR SIR:—I hand you herewith a treatise on "Systematic Feeding of Work Stock a Preventive of Disease," and "Some of the Diseases of Farm Animals," prepared by Dr. W. H. Dalrymple, Veterinarian of the Station. I most respectfully ask that you print this as Bulletin No. 10, Second Series, and earnestly invite the careful perusal by every farmer of its contents.

Respectfully,

WM. C. STUBBS,
Director.

——:o:——

LOUISIANA STATE UNIVERSITY AND A. AND M. COLLEGE,
STATE EXPERIMENT STATION, BATON, ROUGE, LA.

To Dr. W. C. Stubbs, Director:

DEAR SIR:—I beg respectfully to submit to you a digest of a paper on "Prevention of Disease in Work Stock by Systematic Feeding," and of several papers on "Some Diseases of Farm Animals," and ask that you publish the same in bulletin form. Owing to the increasing demands on this department from all parts of the State for information regarding diseases of Stock, I am of the opinion that the perusal of such a bulletin would be beneficial and instructive to our farmers and stock owners.

Respectfully,

W. H. DALRYMPLE.

SYSTEMATIC FEEDING
OF WORK STOCK
A PREVENTIVE OF DISEASE.

Since my location in Louisiana this subject has occupied considerable of my attention, on account of the experience I have had with dietetic diseases ; colic (that bane of every owner of the equine species) holding the premier position and in every case that I can think of injudicious feeding has been the cause.

I may here state that I am fully prepared for differences of opinion with regard to this subject (principally it may be on the plea of custom), because I am afraid I shall have to attack an old system of feeding which is and has been in vogue in the State probably for generations past ; but, if by a clear and lucid reasoning of the matter, with the assistance of a description of the anatomy and physiology of a part of the alimentary track, which will enable us more fully to comprehend the requirements necessary for maintaining these animals in health and working condition, lessening the percentage of mortality, saving a large amount of food, which is fed but not assimilated (no mean item from a monetary standpoint at the end of the year), I hope I may be able to win over some of the old time system advocates, and start out on a more common sense and reasonable track those who are somewhat passive regarding this important subject. If such is the issue, I shall be fully compensated, and I feel convinced in my own mind that those who care to depart from the

old grooves and follow a more rational system will be benefited. There are some people whom no amount of argument would convince, or practical demonstration convert. Prejudice and a stupid adherence to old customs seem to have blinded them, but there are others who will be found desirous of successful reform and amelioration. To change is considered unmanly, and, as existing affairs have probably prevailed for many years, unguided by either the light of reason or science, and having tradition only for their adoption and continuance, alterations would amount to sacrilege or disrespect to the blundering system which has been worshipped so long with such folly and stupidity.

To insure success in any large undertaking economy must be rigidly adhered to in all its workings. Pecuniary loss is often brought about by an undiscovered leakage or defect somewhere, in what may be looked upon as a subordinate branch of the concern. Money may come rolling in at the *front door*, *but* if there is a *back door* incautiously left open, it may just as quickly take unto itself wings. Take for example a large sugar plantation, with its hundred or more head of mules, which represent a large amount of capital; every other requirement may be in perfect harmony and worked upon the most economical principles; the crop may be first-class; the *machinery* of the most modern and improved style for getting the best results with the least possible outlay. Furnaces have been adopted to economize fuel, by utilizing bagasse instead of having to use coal and so forth. In fact the result of the season's yield may have been more than satisfactory, yet the balance sheet at the end of the year comes alarmingly short of expectations. The first question naturally arises: Where has all the money gone? What department requires investigating to account for the excessive expenditure? In many cases, I don't say in every case, I think the evil is not very far to seek. If we walk over the fields we can see all that is left of many a good $100 or $200 mule in the form of a few well picked bones, the victims of flatulent colic from over-engorgement with unmasticated and undigested food, setting up fermentation, evolution of gases, distention, inflammation, often rupture of the intestine and generally death.

If we pay a visit to some of the stables the first thing that attracts our attention is the common manger, packed to repletion with food, free alike to all; but the mean mules, with voracious and gormandizing appetites, are invariably masters of the situation, devouring not only their own rations, but those of two or three others. With special regard to the food, however, it is the quantity in proportion to the number of animals; an allowance to each individual that would satisfy the cravings of an ox, with a stomach ten or eleven times the capacity of that of the horse or mule.

I am told that many plantations feed only once per day, and that at night, and mules get as much as they can eat, which has to last them till the following night. I doubt not, for one moment, that after such a prolonged fast, they will eat as much as they can—that is to say, they will swallow it—but one thing I am confident of: they cannot properly digest it, because in most instances, it is *bolted* and has escaped the necessary mastication and insalivation, and therefore is not in a fit condition to be acted upon by the gastric juices. In fact, the stomach is not only excessively overloaded, but it has the work thrown on to it which should be performed by the teeth and the salivary glands. The consequence is, apart from its injurious effect upon the alimentary track, the food is totally lost, being rendered unfit for digestion and assimilation, having escaped the necessary preparation by the teeth and the action of the saliva, and it passes out whole and unbroken, having failed entirely in its mission, viz: the nourishment of the animal body.

Another point which I would like to draw attention to here, and which from a common sense standpoint seems altogether wrong, that is, feeding such large quantities of bulky food at night. Hard working animals, like hard working men, require rest, and if they have to wade through as much food at once as they ought to have in at lest *three* times, it is not unreasonable to imagine they will occupy time in satisfying the cravings of their empty stomachs which ought to be spent in resting their worn out muscular systems and in allowing of the process of digestion during rest.

For the purpose of illustration, and that this important subject may be made more impressive, I shall endeavor to give, in as concise a manner as possible, an anatomical description of part of the digestive system, with its physiology; by so doing that which is to follow will be more easily understood.

The digestive apparatus of the horse may be looked upon as a long tube passing from the month to the anus, and lined by mucous membrane throughout its entire course. It is studded with glands, or follicles, which secrete a viscid fluid termed mucus, which serves to lubricate its surface, thereby preventing its being injured by substances passing along it. Mucus also assists in the formation of chyme and chyle, and the process of digestion in general.

I am anxious to point out that a great number of horses and mules die from indigestion, colic, inflammation of the bowels, and other diseases of the digestive organs, consequent upon a mistaken system of feeding.

The principal organs of digestion are the lips, teeth, tongue, salivary glands, pharynx, œsophagus, stomach, intestines, with their accessories.

The lips of the horses are very plentifully supplied with nerves of delicate sensation, as can be seen by the animal's careful selection of the food it likes best in the manger, and avoiding any portion, however small, of any material it dislikes. The *ox* has a very thick lip devoid of hair (termed the muzzle) and it has not the same amount of motion as that of the horse; he requires the herbage to be longer, as he collects it with his tongue, which is rough and has great motion; he twists it round a bundle of grass, conducts it between the incisor teeth and dental pad, and then bites it off. The *sheep* will live where the ox would starve; it can bite much closer in consequence of a partial cleavage to the upper lip, which is much thinner than that of the ox and possesses more motion.

The sheep, like the ox, has a dental pad in place of the upper incisor teeth, which is a dense elastic cushion, capable of resisting the pressure and attrition of the lower incisor teeth, which in the ox and sheep are eight in number, and only in the

lower jaw, at the front of the mouth, and being loosely placed in their sockets they can be moved with the fingers. In the horse and mule there are six incisor teeth above and below.

Food is taken or rejected by these animals by their sense of smell; the horse in particular is exceedingly delicate in what he eats; this shows us how essential it is, that the mangers and feeding troughs should be kept clean and rid of any rejected food that may become sour and which most horses will positively refuse to eat.

The food is taken into the mouth and there well masticated and mixed with the saliva secreted by the different salivary glands, which is emptied into the mouth through tubes or ducts. There is also a secretion of mucus in the mouth. There are three pairs of salivary glands grouped around the jaw and they are to a great extent under the control of the nervous system. The saliva is secreted in great abundance, and has a peculiar solvent, lubricating power on the food, besides a chemical action of converting starch into sugar. This moisture very materially assists mastication, showing us how necessary it is that eating should be performed slowly, to allow the food to mix with the saliva, as fast feeders generally suffer from indigestion; with them the stomach has to perform the function assigned to the teeth and salivary glands in addition to its own. After the food has been thoroughly masticated and insalivated, it is passed backward and swallowed, which is termed the act of deglutition.

The secretion of saliva is suspended when the tongue and masticatory muscles are at perfect rest, unless in man it is excited by some mental cause; the flow of saliva only taking place when it is required, viz: during mastication. If the mind is excited, it will also flow; as we hear the expression of a hungry person, his mouth waters when he gets sight of some nice, tempting food. The masticated food or bolus is thrown back by the tongue into the larnyx or swallow, a membraneous vestibule, composed of muscles, which convey it to the œsophagus or gullet, a long, narrow membraneous canal, destined for the passage of food into the stomach. The movement of the muscular fibres of which this

canal is composed is peristaltic or wormlike, and propels the food onward.

The *stomach* of the horse or mule is *very* small, its average capacity being *only* about *three and one-half gallons;* consequently digestion is very rapidly carried on. It is composed of three coats or layers, and it is on the internal or mucous coat that the gastric juice is secreted, which acts on the alimentary matters and renders them soluble by its chemical action; the food then passes on to the intestinal or pyloric end of the stomach, and through the aperture termed the pylorus into the intestines.

The gastric juice is not present in an empty stomach; it is only excited by the presence of food.

To illustrate the difference in size between the stomach of the horse and that of the ruminant, and for a proper understanding as to the requirements of each animal it may be stated that the ox is endowed with *four* stomachs, or, more properly speaking, compartments, designated the rumen or paunch, reticulum or honey comb, omasum or manyplies and the abomasum or true digestive stomach. *Their* capacity averages from fifty to fifty-five gallons.

The rumen occupies about three-fourths of the abdominal cavity.

The ruminants are remarkable for their faculty of swallowing their food imperfectly masticated, and causing it to return over and over again, by a reverse or anti-peristaltic action of the œsophagus (according to the coarseness of the food) for remastication, termed *chewing the cud,* previous to its being finally swallowed and passed on to be acted upon by the gastric juice. There is a peculiar conformation in the lower end of the œsophagus as it regulates the passage of food into the different compartments when sufficiently masticated. The œsophagus does not terminate in the paunch, as in the horse, but is continued onward as a deep groove with two lips, and by the closure of these lips it is made to form a tube termed the "œsophageal groove," which serves to convey the food onward into the third compartment; that is, when it has been completely masticated, comminuted, triturated and impregnated with saliva, it passes on to the third

and fourth stomachs; but when the food is coarse and imperfectly masticated these lips separate and allow it to pass or drop into the first compartment or paunch.

It might be mentioned here, in connection with the description of the œsophageal groove, that very young calves, when taking milk from the cow, not requiring remastication, it does not enter the rumen, but passes on to the third or fourth stomach, but when they have been allowed to run with the cow in sheds littered with hay, straw and such like, they will lick this in, and being unmasticated it enters the rumen or first stomach, which is unnatural, and frequently sets up diarrhœa, fits, and often causes death.

The second compartment is the reticulum or honey comb. It takes its name from the honey comb like cells formed by the mucous membrane.

The third compartment is the omasum or manyplies, the interior of which is occupied with unequally developed leaves of mucous membrane. On all the leaves there are a number of little elevations termed papillæ resembling the appearance of a blacksmith's rasp. Between each of these leaves lie closely pressed cake-like masses of food. Some say there is a digestive juice secreted there; others assert it is an absorbent organ and consider it a pulverizing and macerating apparatus.

The fourth compartment, abomasum or reed, is considered the true digestive stomach and secretes the gastric juice.

In man and all animals, when the food enters the stomach and is submitted to the solvent action of the secretions, the stomach is in constant motion, effected by its muscular walls, which keeps the contents in a state of agitation, and brings every portion of it into contact with the walls of the stomach, so as to be subject to the action of the fluid, which is poured forth from the walls during the digestive process, and the movement of the stomach continues until the organ is completely emptied, when it ceases until food is again introduced.

Seeing then the comparative difference in the size of the stomachs in the horse and ox, the latter animal, with its enormous receptacle intended to accommodate large quantities of

mixed herbage, is only capable of performing slow work and limited exertions; while, on the other hand, the horse is required for speed, long journeys and the removal of heavy loads, which he could not accomplish with the capacious stomach of the ox.

It may be unnecessary to continne a further description of the alimentary canal and its accessories, such as the intestines, liver, pancreas, etc.; but I hope the description given so far will serve the purpose of familiarizing the reader with the organs which perform the primary and very important part in the process of digestion, viz: The preparation of the food for the stomach so that the organ has only its own functions to perform, and not the work of the other organs through which the food has to pass before entering it. It will also serve to illustrate the enormous difference in the capacity of the stomach of the horse and that of the ox, which may have escaped the observation of a great many.

Both in man and the lower animals, the amount of the secretions is proportioned to the wants of the system, and it can be readily seen that interfering with these secretions along the alimentary tube, as by eating food that irritates the mucous membrane, produces a disordered condition which is unfavorable to the digestive process; also taking an excess of food into the stomach is not only useless but injurious, giving rise to irritation of that organ and setting up some incipient disorder, unfitting it to discharge its proper duties, besides upsetting the balance of harmony of vital functions generally, those of digestion primarily and particularly, and the large quantities of nutritious matters present, having had no admixture with the natural secretions, are not rendered assimilable.

The thoughtful and careful observer will at once see clearly that excessive quantities of food given at one time, and especially after a long fast, is not only a very injurious but a most expensive system.

Cases of sickness from injudicious feeding are so common that they are considered trivial, and no doubt are, primarily, but when the errors of diet are allowed to proceed they become

marked by such characters as in the man-wine bibber, and gourmand or epicure, are modified and appear as dyspepsia, biliousness, a severe headache, a tolerable bloating of the countenance, with enlargement of the abdomen, which generally signifies organic disease. Other terminations are broken wind, congested liver, colic, organic disease of the kidneys, or probably, and which is very often the case, speedy death from over distention, due to fermentation of the contained food, causing rupture of the stomach, or some portion of the intestine.

So far then we have confined ourselves more particularly to a cursory glance at the anatomy and physiology of a portion of the digestive tract of the horse or mule, and, by way of comparison, have touched upon that of the ox; this I have done principally to illustrate the vast difference in the capacity of the same organ in the different animals. Some of the grave consequences resulting from a bad system, or more accurately speaking, no system at all, of feeding have also been noticed.

I repeat again that the stomach of the horse is very small in comparison to the size of the animal, and the digestion very rapid and effective. The horse having such a small stomach, requires to be fed frequently in order to supply the demands of the system; not being constructed for long fasting, when the stomach is over-distended and its powers over taxed, it is quite incapable of performing the functions of digestion. This theory accounts for the greater mortality amongst horses and mules from flatulent colic and inflammation of the bowels than any other class of disease.

The most important consideration then for all owners of working stock is: How to feed them to the best advantage and to get them to perform the largest amount of work at the least possible cost?

It is difficult to say what *is* a fair day's work for a horse or mule; it depends on circumstances, such as the distance to travel, weight to draw, condition of the roads and the disposition of the driver. It is of the utmost importance, however, that the condition of working animals should be watched very closely, for if they lose condition they must be either overworked or underfed,

or have a bad horse keeper. They must have suitable work and suitable food to keep them in proper condition, which is only produced by hard work and high feeding, which gives tone and firmness to the muscles, a state in which they are capable of performing the greatest amount of work and possess the greatest power of endurance.

If a horse is overworked and overfed, or the feed is insufficient in muscle producing matter, loss of condition inevitably follows.

There is no economy in overworking animals, as they gradually lose tone and strength, the general condition is injured, they become poor, wear out very quickly, their value is considerably lessened, disease is very prevalent amongst them and the owner's hand is constantly in his pocket buying fresh supplies. In large establishments it is true economy to keep a few animals extra in case of sickness or lameness.

Very frequently the loss of condition is the fault of the horse keeper. It is of the highest importance that the services of a trustworthy, intelligent man should be procured, who will efficiently carry out instructions and take an interest in the appearance and well doing of the animals under his care. A *bad* horse keeper will upset the system of management and the whole of the arrangements in the feeding.

Regularity in feeding is very essential. A horse should be fed at least *three* times per day; for the reason previously stated, his digestive organs are not constructed for long fasts. I don't mean that he should be allowed that feed extra in amount of food than if he were only fed twice, or two-thirds more than if he were only fed once a day, but that the necessary total amount for the day should be divided into at least *three times.*

Many large establishments, owning some thousands of horses, divide their day's rations in four; and all [illegible] corn. Given
It diminishes the interval of fast[illegible] and binding, but when
ravenous, but merely appetize[illegible] of each other.
which, in a very large perce[illegible]ale of feed for work horses or
cated, digested and assimil[illegible]ands, which can be increased pro-
minimum. [illegible]he requirements necessary to form

The question may naturally arise here: How are *we* to feed our mules so often in the course of the day during the busy season when they are in harness from morning till night? I'll tell you how it is done in other places under similar conditions, and it was the grave results and heavy losses from long fasting that impressed upon some one the necessity of instituting some plan to obviate it. The plan is the *nose bag*, which can be made of some porous material with a strong bottom in it and a strap from the upper border, that can be hung over the animal's head. The driver can take his mule's feed in this, and when he has an opportunity, such as taking his own lunch, he can slip the feed bag on to his mule's head and allow him to eat; if only a few mouthfuls, it will satisfy the cravings of hunger, at all events to that extent.

This large amount, which is fed by many stock owners at night, should be reduced at least one-half, for two reasons: It is excessive, and as before stated, the time occupied in eating it must deprive the animals of so much time for well-earned rest, which, with a sufficiency of food, they could enjoy, but with engorged stomachs of unmasticated food they cannot possibly be benefited to any appreciable extent by nature's calm restorer—sleep; to say nothing of the disease such a system engenders. These are no empty theories; they are established facts, based upon actual experience, which have been proven after close observation and repeated experiments by most practical and capable men, who have the interests of the stock owning public at heart. Endless experiences could be enumerated of men who have the responsibility of large numbers of hard working animals, and whose positions, so to speak, depend upon the condition of their horses, and the condition of the feed bills.

Suffice it to say, however, that the secret of success lay's in the system of feeding small quantities at a time, and often.

It is difficult to the different elements necessary for the re-
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quirements of the animal econom the subject of the composi-
I do not propose to enter upo more especially to direct at-
tion of food here, my object being od should be given rather
tention to systematic feeding; *how*

than *what* should be given. Most people know that all animals require for their nourishment food containing the proximate principles, nitrogenous, non-nitrogenous and mineral, and it has been proven that the absence of any one of them induces starvation and death. What is necessary, then, in all nutritive food is that it contains these three principles in proper proportion, so that all the tissues of the animal body may be sufficiently nourished.

In all animals water is also necessary, not only as a diluent, but as forming a component part of the blood and tissues.

There are differences of opinion as to whether horses should be watered before or after feeding. One eminent veterinary authority recommends it before feeding, and gives his reasons thus: The water passes directly through the stomach into the intestines in a few minutes, which he proved by giving colored water to a horse a few minutes before slaughtering it, when he found it in the intestines; and he argues, if you give the water after feeding, it does not leave the stomach, but dilutes the gastric juice, and instead of the stomach performing its proper functions of digestion, partial decomposition of the food takes place, then follow the consequences of indigestion.

As a rule, pure water may be allowed with benefit and advantage, in such quantities as the animal seems to require, provided he be not heated or exhausted by work, when it should be judiciously supplied in moderate and repeated quantities until his thirst is satisfied.

It is sometimes difficult to arrive at what may be considered the best feed for work stock. Full rations of corn by itself is fattening for a time, but too laxative in its action, and should be mixed with other food materials having the opposite tendency to counteract it. Now, beans or peas are especially valuable, as their physiological action is opposite to that of corn. Given alone, beans and peas are too heating and binding, but when mixed they counteract the effect of each other.

I have here noted down a scale of feed for work horses or mules weighing about 1000 pounds, which can be increased proportionately, containing all the requirements necessary to form

a good ration, viz: Shelled corn, seven pounds; oats, three pounds; peas, three pounds; hay chopped, thirteen pounds.

The ingredients of this ration are mixed together, making a total of twenty-six pounds and dividing into at least three feeds. Of course, the preparation of this scale of feeding would necessitate the use of a little machinery in the form of a hay chopper, corn crusher, etc., and all this chopping and mixing may seem very unnecessary and expensive, but, depend upon it, on a large plantation, or in fact on any place where a number of work stock are to be fed, the first cost would be the greatest, because I have no hesitancy in saying that what would be saved in feed and the reduction of mortality amongst work animals would more than doubly repay for any extra trouble and outlay.

SWINE.

The actual cause of diseases amongst hogs, such as our "razor back," or in fact any other breed whose domain is so far reaching and whose victuals are so varied, the ingredients of which are not always ascertainable, is a problem rather difficult of solution. If the hog was treated less as an outcast and more on an equality with other animals of the farm, the causation of disease might be more easily localized and preventive and curative measures more intelligently determined on; but so long as the hog is tenant of broad acres with its endless variety of organic life, some beneficial and some prejudicial, it will be rather a hard matter to combat disease and act with any degree of certainty or rationality in treatment.

To the veterinarian, whose dumb patients cannot tell the cause of their ailments, the *history* of a case or cases assist him very materially in arriving at a correct diagnosis; the cause can then be in most instances located and measures taken for its removal; but, when hogs are allowed to run wild, out of sight of their owners for months probably, devouring everything that comes in their path, the first indication of disease may be one or more victims laying about, but the direct history of and cause for such a state of affairs will be about as bad to get hold of as the razor back himself. On the other hand, however, when the movement of hogs are somewhat under control, and the composition of the food they eat is known to the owner, should sickness come amongst them, it is often a simple matter to see the cause. Take for example a farmer on the outskirts of a town or

city, where he can get slop from hotels say, for his hogs, which in most instances is good feed. All goes well for a time, the hogs are improving rapidly, till some morning he finds to his utter astonishment that some of them are dead and others sick; the latter, however, presenting exactly the same symptoms, varying of course according to the severity of the attack. The conclusion at once arrived at by the owner is, that his hogs are the victims of the cholera, without stopping for a moment to think what might have caused the fatality; whereas, if the truth were known, some deleterious material has found access into the slop, of a poisonous nature, causing death to some, and the identical symptoms in the living animals, all having partaken of the same toxic agent or agents.

Numbers of swine have been supposed to be suffering from cholera, when in reality there was no contagious disease whatever prevailing, but they were sick and dying because the rules of common sense had not been observed in their care.

Because a number of hogs are taken sick at one time and with like symptoms, it does not follow that they are suffering from any contagious disease. The knowledge of this fact may be the means of great saving to many. Often it is not medicine that is required, but a change of food and surroundings. To illustrate the idea I wish to convey, I will give you one case I saw recorded in this connection. A farmer kept his swine in a lot of about one acre, where they had but little exercise, regular food and sheltered bed. After gathering his corn he turned his entire drove into a field to glean; they also had the range of a forty-acre lot. Two days afterwards he found a number of his shoats sick, five of which soon died. The disease was pneumonia or lung fever. The post mortem in each case showed at least one lung hepatized and inflammation of the pleura.

The Cause—The hogs were previously confined without exercise and had regular food and sheltered bed. They were then turned out in a large range, exercised fully, slept on bare ground at a time when the weather changed suddenly colder, and the result was lung fever and death. No medicine was needed to

prevent the healthy shoats from contracting the disease, and a little care and medication would probably have cured the sick.

When large numbers of hogs are shipped from other parts of the country where contagious diseases amongst swine are known to exist, it is then possible in many instances to trace an outbreak to the imported animals bringing the contagion with them, and there are many errors in diet which predispose, errors which do not cause death it may be, but which render the hog peculiarly susceptible to contract contagious diseases on the slightest provocation—that is, on the infection being introduced by an affected animal.

The principal predisposing causes might be enumerated as follows: Any causes which have a tendency to reduce the vital strength of the animal, disorder the stomach, or deprave the blood in any way, such as foul air, food, improper in quality and quantity, bad water, filth, malaria, atmospheric influences, etc. All these causes combined cannot generate the disease, but any one of them, by reducing vitality or disordering the system in any way may be the cause of the disease obtaining access to the drove.

Perhaps the most fatal disease of swine of an infectious character is "hog cholera."

From investigations and observations made some few years ago by officers of the Bureau of Animal Industry, or by medical gentlemen working in concert with the Bureau, we find that under this class of diseases were found diphtheria, typhus and typhoid fevers prevailing among the large numbers of diseased animals examined. For convenience all three may be classed under the term "hog cholera" (a name which is perhaps more familiar to you than the others), although they differ somewhat in their pathalogical lesions, but to the uninitiated the line of distinction is, to a large degree, difficult to draw, and perhaps it is a matter of no very great importance, as they are all of an infectious character and require to be dealt with in a similar manner with regard to hygienic care.

Hog Cholera.

I shall confine myself principally to the typhoid fever of swine, as presumably it is of most frequent occurrence in large outbreaks of hog cholera. We define it to be a specific, continued eruptive fever, depending for its origin on a specific organism. It is attended with great prostration, stupor, tympanites, diarrhœa, showing specific anatomical lesions on the intestines, viz: ulceration of the intestinal glands; especially those situated near the ileo-cæcal valve, that is, where the small enters the large bowel.

The period of incubation or the time elapsing from the exposure of the animal until the outward manifestations of the disease is about five or six days. When uncomplicated the disease runs its course in from about nine to fourteen days.

The Symptoms are: Loss of appetite, photophobia, standing with its head in a fence corner, or lying in such a position as to keep the light from its eyes. If a number of animals are in a pen they lay all huddled together. When urged to move they may, but a short distance only to resume their former position. The expression of the countenance is haggard, ears drooping, breathing hurriedly, skin hot and dry, high fever, temperature often as high as 107° F., urine increased, diarrhœa, tympanites, cough, stiffness of the hind quarters, a dirty secretion about the eyes, and the membrane lining the eyelids inflamed. On white skinned animals can be seen reddish blue patches behind the ears and on the chest and abdomen, also on the internal aspects of the fore and hind limbs, with an eruption of small vesicles which may go on to postules. Bleeding at the nose is a common symptom. The hog may lie for an hour in a semi-stupid condition, but still restless, and showing signs of nervous excitement. The symptoms are generally very uniform during the course of the disease. As the fever progresses great weakness is manifested and there is entire loathing of food. If the case is a severe type, the symptoms will be aggravated. The bowels becoming enormously distended. The urine scanty and highly colored, which may be passed every time the animal is

moved. The discolored patches, which are at first hot and painful to the touch, often become cold, humid and insensible. Tremblings and convulsions are manifested, the animal grinds his teeth, and owing to contraction of the flexor muscles of the limbs, stands upon his toes. These convulsions generally become more aggravated and may continue to the end, or coma may set in, until death ends the scene. The foregoing symptoms are, however, liable to modification dependent upon the intensity of the fever and localization of the poison. In some instances the virus seems to expend itself upon the membrane lining the chest and abdomen, inducing pleurisy or peritonitis, or on mucous membranes as seen by bronchitis, etc.

The Morbid Anatomy of the Intestines Revealed on Post Mortem—The small intestine almost invariably congested and covered with spots of extravasated blood, both on its inner and outer surfaces, sometimes, however, it escapes ulceration altogether. The large intestine always has the most characteristic appearance; there are isolated, or it may be confluent rounded ulcerations at or around the ileo-cæcal valve, where the small bowel joins the large one.

These ulcerations in this situation are perhaps the most characteristic post mortem lesions in hog typhoid. I would like to impress upon farmers, owning hogs that may become victims, that they should carefully inspect the inner coat of the bowel at the above mentioned situation by slitting it open, exposing the mucous surface. This is important, because it may happen in many cases, there may be no other morbid appearance to account for the severe symptoms until the inner coat of the intestine is exposed.

Of Predisposing Causes.—I have previously stated that any causes which have a tendency to reduce vitality, disorder the stomach, or deprave the blood in any way, may be the cause of disease obtaining access to hogs, and this holds good in any other animals.

It would occupy a great deal of time to take up and discuss separately each of the many conditions which predispose to dis-

sease, and besides, in this present day, when hygiene has become a science, it appears to me most people will be able to discriminate between good and bad sanitary aud hygienic measures. One can scarcely take up a newspaper or journal that has not something to say on the subject. I might say, however, that a frequent cause of disease amongst swine is confinement in pens without ventilation, where the air does not circulate freely enough to carry off the carbonic acid expelled from their lungs, in which case the atmosphere becomes very foul and loaded with noxious gases. On the other hand, it is a common saying that wild hogs do not have cholera, and, acting upon this idea, many farmers allow their hogs to run wild, without shelter, and are disappointed to find disease appear and carry off a large proportion of the drove. In those cases where the hogs are not confined and forced to breathe foul air, but are exposed to the vicissitudes of the weather and with loss of vital force, in breeding, etc., they become weakened and succumb.

It has been stated that errors in diet have done more to help the spread of fatal diseases in swine than any other cause. Observant farmers in many parts of the country have learned by experience that such is the case and have at once resorted to change. If feeding clover, they change to dry corn, and if dry corn, to clover. This rule has saved many droves from the ravages of infectious diseases. A rule was suggested by one of the Commission of Investigation of Diseased Animals a few years ago, by which the farmer could tell what course to pursue, and which might be well for us to take note of here. If the herd is not doing well, eating indifferently and appearing less active than usual, at once examine the tongues of a few, and notice the color. If the tongues are red and contracted, give sour slop or turn them on clover pasture or on green food, and they will at once improve. If their tongues are large, pale and flabby, give corn, or corn meal, and add soda to the feed, or soda and milk, but give no sour slop. The large, white, pale tongue shows that the stomach and blood are in an acid condition, and require

alkalies The contracted red tongue shows a sub-acid condition, and that acids or sour remedies are needed.

When raw corn is used as a steady diet for hogs. sour slop will assist in its digestion and should be given regularly to prevent as far as possible the evil results of errors in diet. The use of coal, charcoal or ashes assists in preserving the animals in health by supplying certain chemicals needed by them.

The Drinking Water should be clean and pure and should be within reach of the hogs at all times. Stagnant water, loaded with organic impurities, is unfit for any animal to drink.

Foul Air by vitiating the blood, is a common predisposing cause of disease. Swine breathing air loaded with carbonic acid and ammoniacal gases for a length of time, cannot remain healthy, any more than can man, and the same natural results will follow, viz : impure blood, disease of the lungs and other internal organs.

Scrofula is another predisposing cause and one of the principal causes of large mortality in diseases of swine. The two chief causes of scrofula are breeding young sows and in-breeding. All these causes mentioned predispose by lowering and debilitating the animal system, thereby laying it open to invasion by the germs of infectious diseases.

The Treatment is of two kinds, namely : Preventive and curative or hygienic and medicinal. The secret of success in preventing the inception of contagious diseases by hygienic care can be included under two rules. The first is. keep the system of the animal in a healthy state ; and second, avoid exposing it to poisonous contagious influences. To follow up the *first rule* successfully we must have fresh uncontaminated air, suitable food, fresh water and avoidance of low, damp places for sleeping quarters ; also avoidance of in-breeding, which is known to engender the scrofulous diathesis.

The second rule requires that all dead organic matter, such as straw, hay litter or other matter which is liable to catch the poison floating in the air or carried by the wind, should be kept away from the animal. If there is any disease in the vicinity no

animal should be allowed to pass over pasture where healthy hogs are allowed to run.

As a medicinal preventive, the hypo-sulphite of soda has been recommended in slop or milk, or dissolved in the drinking water. Common salt should be furnished to all swine every day.

The Curative Treatment should be adopted on the same general principles. If the disease has appeared try to prevent the spread at once. Separate immediately the healthy from the sick animals. All organic matter, such as hay, straw, litter, etc., to which the hogs have had access must be burned, the lots cleaned up and every possible effort made to destroy the contagion. Healthy hogs should be placed on fresh ground over which the sick ones have not passed. There is no medical treatment that can be positively recommended as a preventive for contagious diseases. The important point in typus fever and diptheria is to relieve the bowels as speedily as possible, and for this purpose castor oil or epsom salts should be given till that object is accomplished, but in typhoid fever, diarrhœa is a prominent symptom and purgatives should be avoided. I think it was Prof. Law, in one of his reports, speaks highly of the value of loose dry earth as a disinfectant. This depends largely on its antiseptic and deodorizing properties. Finely powdered dry loam or clay is a direct ntiseptic and has the power of absorbing the noxious gases produced by organic decomposition and the growth of bacteria; it is besides porous in an eminent degree and thus transmits through its substance a large amount of atmospheric air and determines the less deleterious fermentation.

In a general outbreak of hog cholera, the most effectual method to stamp out the disease is, the destruction of all hogs suffering from the disease, their burning or deep burial in a secluded place and the thorough cleansing and disinfection of the premises and utensils and the quarantining of all domestic animals that have been in contact with the sick pigs.

Extensive scientific experiments have been made with inoculation for hog cholera, but in the hands of incompetent experimenters more harm than good might result, as the disease might be introduced and spread among healthy animals.

Mange, Scabies, Itch or Scab,

Is a contagious skin disease due to the presence of animal parasites belonging to the class *Arachnida*, family *Sarcoptes*, of which there are according to Gerlach, three genera. The first is *Sarcoptes*, that burrow in the skin; second, *Dermatodectes*, that simply bite and hold on to the skin; and third, *Symbiotes*, living together in large numbers and piercing no further than the epidermis in search of food. All these parasites live on serosity. the effusion of which is caused by the irritation which they excite.

The parasite causing this disease in the hog is the Sarcoptes suis.

This is a truly contagious disease, contracted by contact, but the susceptibility in the hog to contract mange is no doubt the result of want of cleanliness and it is a troublesome disease to get rid of. It may be discovered by blotches or small postules which appear on different parts of the body. The irritation which these minute parasites cause is very great, as can be seen by the hogs scratching and rubbing themselves against some stationary object.

As a remedy it is best to first wash the animal with tepid water and soap to soften the scabs or scales and afterward apply externally each day a mixture of one part of sulphur, one part of carbonate of potash and eight parts of oil.

As internal treatment two ounces of epsom salts should be given in slop, and in each meal for three or four days should be mixed one-half an ounce of sulphur, one-eight ounce of nitrate of potash. Careful attention to cleanliness in the hogs and their surroundings should be strictly observed,

Inflammation of the Lungs

Of swine is sometimes thought to be infectious, but it is generally brought about by exposure to the inclemency of the weather. Careful attention to hygiene, feeding and dieting and the general comfort of the animal will in most cases effect a cure.

If the hog is in good condition and fat, perhaps the butcher's knife would be the best remedy.

There is a parasitic disease among hogs which is transmissible to the human subject by ingestion, a short account of which may not prove uninteresting. It is known as

Trichinosis or Flesh Worm Disease.

It is caused by a small Nematode or round worm called the Trichina Spiralis, which is one of the smallest of the intestinal parasites and exists in two distinct forms, viz: the partially developed or encysted and the fully developed or intestinal.

The history of the Nematode is as follows; In a partially developed state it is found encysted in the muscles of the pig; here it is sexually immature, but when the human subject partakes of the flesh imperfectly cooked, in the stomach the cyst wall or capsule is ruptured, the embryo escapes, and in forty-eight hours it becomes sexually matured. Coition takes place, and about eight days after entering the stomach the young are born alive, commence to migrate, entering the muscular tissue of the abdomen chiefly, and there become encysted. During migration they cause a considerable amount of disturbance which is sometimes fatal in the human subject.

The symptoms in man are, loss of appetite abdominal pain, gastritis and obstinate vomiting. The symptoms commence about ten days after the flesh has been eaten and may last for several weeks. The patient becomes weak, limbs swollen, and is unable to move. Elevation of temperature, quick and frequent pulse. If the patient can bear up till migration of the parasite is over they do no further harm.

In the pig they cause similar symptoms, but the disease is not generally diagnosed till after death.

Another internal parasite of the pig is the *Cysticercus Cellulosa*. This is the encysted or encapsuled form of one of the tape worms of man, the Tænia Solium. It is given to the pig by the extruded ova from the human subject, and when encysted in the hog causes what is known as

"Measley Pork."

In its passage from the bowels of the pig to become encysted it gives rise to the following symptoms: The animal feeds but does not care to rise, abdominal pain is present, coughs occasionally, its voice being hoarser and rougher than usual, due to some cysts becoming located in the organ of voice. If a minute examination be made of the tongue, cysts may be seen on its inferior surface. Post mortem examination shows the cysts resembling small oval calcareous masses from one-twenty-fourth to one-sixth of an inch in size and each containing a scolex or embryo, which, taken by the human subject without proper cooking, develops into the tapeworm termed Tænia Solium.

The treatment in the hog is, Prevention.

SHEEP.

There is no other domestic animal upon which climatic influences are so marked. Pure bred animals of any of the distinct breeds of any country, when removed to a locality where the soil and climate are quite different, will in the course of two or three generations gradually change their type.

The quality of the wool is dependent upon the climate and soil, not less than upon the breed of sheep. Generally speaking the native sheep of a district have special qualities, the result of climatic influences, which render them, when improved by careful selection and breeding, or by crossing with some other strain, more profitable to keep in that district than any other breed.

The natural home of the sheep is upon the uplands, and although a limited number will for a time thrive admirably upon the succulent grasses of lowlying pastures they are apt to become affected with certain diseases which shall be alluded to.

With a few exceptions the commoner diseases affecting sheep are, in a large measure, due to the invasion and ravages of parasites, both internal and external.

We shall first consider the diseased condition known as

Foot Rot.

Many Veterinary writers and observers differ in their opinions as to whether this disease is contagious or non-contagious.

Some consider that by experiment they have proved beyond doubt, its contagious nature having produced the disease, by applying between the claws of feet that were healthy, shreds of

loose horn or matter from diseased feet; but, as another eminent authority remarks on this question, this proves nothing further than that the discharge by virtue of its irritating properties induced inflammation of the inter-digital tissues in a manner similar to that which would result from the application of any common irritant, or even a foreign body applied to, and retained in the same place. The only foundation for the assumption of the virus of foot rot lies in the fact that the introduction of the matter from a diseased foot to the healthy foot by puncture through the horn, has produced foot rot in some cases although it failed to do so in others. Continuing the same writer says: "We are quite prepared to learn that an injury to the horn of the foot, followed by the contact of a mixture of moist epithelial cells and particles of dirt, will, if applied sufficiently long, produce foot rot; we know that dirt and moisture will suffice without any additional element." In his lectures, the late Prof. Dick, one of the most eminent veterinarians of the century, remarked as follows: "Foot rot is the name given to a disease in sheep, similar to 'Foul in the Foot' of horned cattle. Its consequences are disastrous and ruinous, attacking if neglected the whole flock, so that in feeding they actually crawl on their knees; hence it is regarded in the last degree contagious. After a good deal of investigation, however, I have arrived at a different conclusion, and discover in its history nothing more than the result of that domestic state to which the sheep has been subjected. By nature, not unlike the goat, it frequents the summits of lofty mountains where its hoofs, altogether analogous to those of the horse, are exposed to much tear and wear. When from these Alpine regions we transfer the sheep into our grassy lawns, our moorish lands, or sandy soils, this wearing away of the crust is put a stop to; it grows too long and proves a great encumbrance. In this state it is exposed to many injuries, among others, from the long grass of the pastures, and itself necessarily injurious to the soft parts beneath, and hence lameness, inflammation and suppuration to the extent of casting the hoof are the consequences. The circumstance of this disease appearing epidemically arises from the whole flock being placed in precisely similar circumstances.

This disease is rarely seen upon dry uplands, or light arable soils, for which sheep are specially adapted, but upon low-lying lands subject to overflow, with long succulent grasses it is very prevalent, the grass first irritating the inter-digital tissues, causing inflammation, and as a result the foot becoming disorganized.

Causes.—Although the tendency to foot rot may be hereditary, and the progeny of some sheep are more liable to it than others, it must be admitted that the great cause is moisture producing softening of the horn. Where the grass is long it insinuates itself between the claws ; the part of the upper and thinner portion of the inner wall of the digits is the first to give way, and the disease may be said to be inter-digital, but where the grasses are short, mossy, and the soil sandy, the solar aspect of the foot is the first to suffer. Whichever way it is manifested, it is generally due to wet soil, and in its prevention and cure this fact should be borne in mind. It will be seen, then, in trying to prevent foot rot, that removal from a wet to a dry, sound pasture is of pre-eminent importance.

There is no end to the so-called specifics for this disease, which are generally caustics of different kinds. The tri-chloride of antimony, commonly known as butter of antimony, however, is perhaps as effectual a remedy as any other caustic. The hoof to be first pared and trimmed, so as to remove all loose or superabundant horn. Should fungoid growths be prominent a little nitric acid carefully applied by means of a feather to the surface of the growths may be used with advantage If there be scalding between the claws, muriatic tincture of iron, diluted with an equal quantity of water, will be found a good application.

Liver Rot or Fluke Disease.

This disease is caused by a trematode parasite, flat and leaf-like in shape. known as the Liver Fluke. There are three varieties of the fluke, viz : The Distoma Hepaticum, Distoma Lanciolatum and Fasciola Hepaticum. The first mentioned is perhaps the most common ; is about three-quarters of an inch long by one half an inch broad.

The anatomy and life history of this parasite are as follows: In color it may vary from yellow to dark brown, depending on the time at which it is examined. The body surface is studded with a number of suctorial discs by which it can attach itself to the mucous membrane and from it derive its nourishment. A rudimentary digestive system is present, but it is only hollowed out in the body cavity, and not suspended in fluid as in some others. The digestive system has only one external opening situated anteriorly, and serving the double function of mouth and anus. A water-vascular system is present and the sexes are united. The generative organs are largely developed, the opening of the male and female organs being found at a spot on the inferior and left aspect of the body, and known as the "generative pore." The young are always developed oviparously.

From a sheep already affected with liver rot the matured fluke or its ova becomes encysted. If the fluke be extruded, exposure will cause decomposition of the cyst wall and the ova are liberated. They are then conveyed by some means to fresh water pools, there the enveloping membrane is ruptured and the embryo liberated. This embryo is conical in shape, having its surface covered with ciliæ or little hair-like processes, by which it is able to swim about in the water, and at its anterior extremity is a small flat probocis and pigment spot which is believed to be the organ of sight. After swimming about for a time, this embryo casts off its ciliæ and passes into the body of some mollusc or snail. Here an important change takes place, and the embryo becomes transformed or converted into a sporo-cyst or sac, which is capable of and commences to develop larvæ from its internal surface. The larvæ thus developed are liberated and swim about for some time by means of a tail, which has been provided them, and in this state are called "cercariæ or second larval stage." After about two or three weeks each cercaria loses its tail and again enters the body of some mollusc where it undergoes further development, then with that mollusc it passes into its final host, the sheep. Having arrived there it is liberated, passes with the food into the intestines, and from the in-

testines it enters the bile ducts and on to the liver where development is completed.

Symptoms in the Sheep. For a short time after the animal is attacked it seems to thrive better than previously and improve in condition. This lasts for perhaps three or four weeks after infection, then the animal becomes dull; feeds irregularly, loses flesh; the skin becomes hard and dry; the mucous membrane of the eye is pale; the blood vessels have a characteristic yellow appearance. The abdomen becomes pendulous; the wool mats together and drops off. The back is arched and tender on pressure. There is swelling at various parts of the body. The tissues along the spine crepitate or crackle when pressed. The hearing becomes weak; the pulse quick and frequent. The bowels may be constipated in the first stage, but diarrhœa is always present before death.

Post Mortem Appearances. The muscular tissue is pale and the fat of an unhealthy appearance, and none of the tissues harden up after being dressed. There is always emphysema (swelling produced by air or gas in the cell tissue) along the spine, and often a considerable quantity of fluid in the abdomen. The liver varies in the different animals, its appearance depending upon the seat of the parasites. In some cases it is enlarged, with hard calcareous masses found throughout its substance. In color it varies from bilious yellow to dark brown, nearly black. Adhesions are found between the liver and its surroundings. The walls of the bile ducts are thickened and their diameter diminished. The number of parasites found may vary from ten or twelve to hundreds. They may be found in groups, completely occluding the passage of the bile ducts which may be increased in diameter to accommodate them.

These parasites are most common in low lying and undrained districts, more especially on lands subject to overflow, and most prevalent after wet springs.

Prevention consists in removing the sheep to high and dry lands or in draining and drying the pastures, as the parasite is only developed in the presence of moisture. If this is

not practical, a liberal supply of salt or lime spread over the surface of the pasture may prevent the disease.

Curative Treatment. After the liver has become affected, little can be done, as agents given to destroy the parasite might injure the digestive system. The most rational treatment is to make the sheep ready for the butcher as soon as possible. If treatment must be adopted give a laxative such as oil or epsom salts in the first stage; afterwards good dry food liberally salted, and follow up with tonics, such as sulphate of iron or copper, or pulverized gentian root. These remedies, however, are only palliative.

Parasitic Disease of the Lungs.

In lambs bronchial irritation from the presence of Nematode parasites or round worms, termed Strongyles, is of frequent occurrence and is known by various names, such as the "Husk," "Hoose," "Parasitic Bronchitis," "Phthisis Pulmonalis Verminalis," etc.

The parasite causing this irritable condition in lambs is termed the "Strongylus Filaria." This order of parasites have a rounded body from a few inches to several feet in length, distinct annulation, but no segmentation is present. The digestive system is well developed. The mouth is anterior and generally surrounded by papillæ, an œsophagus or gullet connects the mouth with a muscular stomach, which is continued by a straight intestine to a postero-inferiorly situated anus. The whole of the digestive track is suspended in a body cavity containing a corpusculated fluid. A water-vascular system is always present. The nervous system is represented by a ganglionic ring surrounding the gullet from which filaments extend backwards. The sexes are distinct, and the males are smaller and fewer in number than the females. The reproductive organs differ in the different species of Nematode. They are always situated posteriorly, and the young may be born oviparously or viviparously. In some cases reproduction and full development takes place in the same host, while in others the young pass

through one or more intermediary hosts before they are completely matured.

Nematode parasites exist principally in the stomach and intestines, but may also be found in the skin, blood vessels, muscles, lungs and occasionally in the eye.

The Strongylus Filaria is from one to two and a half inches long; the female is white, longer than the male, which is of a yollowish white color and its body is of uniform size, but tapered at both ends; its head being short and rather angular.

The life history of this parasite is not thoroughly understood. The most rational theory, however, is that the ova are taken up by the lamb from a previously infected pasture, either as the free ova, or in some intermediate host. In the stomach the wall of the ovum is raptured and the embryo escapes, passes through the walls of the stomach into the circulation and is carried into the lungs. There the parasite may be found in the lung tissue or in the bronchial tubes, and when in the latter, gives rise to considerable irritation.

This parasite has been found in the blood vessels and heart, which goes a long way to support the theory that it travels through the circulation; some authors, however, are of the opinion that the parasite passes directly through the larynx to the lungs.

The Symptoms in the lamb depend on the situation of the parasite in the lungs and also whether they are present in the intestines; if in the latter diarrhœa is always, and dysentery from straining and abdominal pain, may be present.

When in the lungs, bronchial irritation is often constant, but this is not always the case. The animal has a dry husky cough, respiration is increased, feeding irregularly, losing condition, discharge from the nostrils and eyes. If the nasal discharge be examined, the parasite may sometimes be found in it.

The Preventive treatment is to isolate the affected animals and remove the healthy ones to fresh dry pasture, as the disease prevails particularly in low damp situations.

As Curative Measures, inhalation of chlorine gas has been recommended, which can be easily generated by the

action of sulphuric acid on chloride of lime. Should the animal be too weak to stand the chlorine gas, sulphurous acid gas may be substituted, which is also safer than the chlorine. It is made by burning sulphur, which, combining with oxygen during combustion, gives off fumes.

The patients made to inhale any of these gases should be confined in a building during the operation.

Another method is to open into the trachea or wind pipe at the under portion of the neck, where it comes nearest the inner surface of the skin, and inject into it by means of a small syringe a preparation composed of: Turpentine, half a drachm; laudanum, 10 minims; olive oil, 30 minims.

When the parasites are in the intestines several doses of turpentine in oil should be given and rock salt should be allowed the sheep to lick.

Grub in the Head.

The parent of this grub or bot is the sheep gad-fly, the "Oestrus ovis." These flies are generally included in the genus Oestrus, Oestridae forming a rather numerous family of the Insecta and belonging to the order called Diptera.

Dr. Cooper Curtice, in his animal parsites of sheep remarks that the Oestrus ovis, which seems to bridge the gap between the external and adult internal parasites, differs from these groups in being able to actively infest its host with its young without an actual contact or intermediate bearer. Lice, louse flies and scab insects may do this in a less degree, but not to that possessed by the Oestrus. The Oestrus larvæ are never transmitted by contact. They must mature, fall to the ground, metamorphose and emerge as adults, before the females can infest sheep. The internal parasites are passively conveyed into sheep along with the food and drink consumed and never actively enter into the transmission; the Oestrus forms the single exception. This fly is parasitical only in its larval stage and consumes months in its development. Because it cannot take nourishment when adult, not being provided with a mouth, it is believed to pass a very ephemeral adult stage.

These flies are to be found all over the world, wherever there are sheep. It was thought by many of the older writers that the Oestrus ovis deposited eggs, but according to Professor Riley and others, it deposits the perfectly formed living grub in the nostrils of the sheep. Unlike its congeners, the bot fly of the horse or ox, it neither chooses the stomach nor back of its bearer as a place of residence for its larva, the bot, put deposits the young larva itself at the margin of the sheep's nostrils, which seems to have quitted the egg whilst yet within the oviduct of the parent insect.

When once having gained access to the nasal passage, it begins to make its way upwards, and they may be found within the cavities of the head (the cranial sinuses) firmly attached by means of little hooks, and in this situation they remain until they have perfected this stage of their development.

When the larva is mature it escapes from the nostrils, falls to the ground, bores into it for an inch or two, and according to Prof. Riley, contracts during the next 48 hours to half its former size. Some authorities say it remains in this State for three or four weeks, other fifty to sixty days, depending on the weather, when it emerges as the fly to complete the cycle of its existence. On account of its rudimentary mouth it is unable to eat, and its office seems to be merely to reproduce its species.

Symptoms Presented by Sheep Attacked. The moment the fly touches the nose, the sheep commence to shake their heads and strike the ground with their fore feet. At the same time holding their noses close to the ground, they run away indicating that they are taking every possible means to shake off and dodge their tormentor; they also smell the grass as they go along, as if suspicious that more are lying in wait for them.

The members of the flock will collect together in groups, huddle under buildings, along fences, under shade trees, holding their noses under their fellows, and in short trying every possible method to evade, and to render it difficult for the fly conveniently to get at the nostril.

Treatment. As preventive measures, a practical means

consists in smearing the nose with tar ointment, a mixture of equal parts of tar and grease or fish oil applied directly with a brush. This should be repeated periodically throughout the season, during which the fly is known to be troublesome. All grubs seen on the ground should be destroyed, and the heads of sheep that have died or been slaughtered should be looked after so that the mature grub cannot escape to the ground. Sheep yards and enclosures should be cleaned and sprinkled with lime from time to time. Perhaps the most convenient medicinal treatment is fumigation or nasal injections. The following method for fumigating has been recommended by Blacklock: One person holds the head in a convenient position in front of the operator, who having half filled a pipe with tobacco and kindled it in the usual manner, places one or two folds of a handkerchief over the opening of the bowl, then passes the stem a good way up the nostril, applies his mouth to the covered bowl and blows vigorously through the handkerchief, continue for a few seconds, withdraw the pipe and repeat the operation on the other nostril.

Powers advises the following nasal injection: Procure an elastic bulb syringe with a small nozzle six inches long. Mix turpentine and linseed oil in equal parts. Accustom yourself to the syringe to be able to guage it accurately. Let the affected sheep be held before you in a natural position and carefully probe the nostril until you find its bearing and depth. Then charge the syringe, introduce it to the extremity of the nasal cavity, and with a quick pressure inject about a teaspoonful of the mixture. Withdraw at once and let the sheep recover from the effects of the shot. Treat both nostrils in a similar manner. The mixture should be kept well shaken.

Neumann advises at all times, if the number of animals affected is considerable, the malady should be left to follow its course, and those sheep which present the gravest symptoms should be sent to the shambles. But in the case of valuable animals treatment of some sort ought to be adopted.

Mange, Scabies, or Sheep Scab,

This disease is due to minute parasites which live on the skin of their hosts. The scab is caused by the inflammation they excite in burrowing in the skin that they may procure food for themselves and young. There are three forms of the disease, viz : Sarcoptic, Dermatodectic and Symbiotic, each caused by a parasite belonging to the class Arachnida. The Sarcoptes ovis attacks sheep about the face and head and gives rise to so much irritation that by constantly scratching and rubbing, the face becomes one mass of scabs or scales, which may interfere with the sight, respiration or feeding. They may extend to the limbs, but rarely to the body.

The Symbiotes ovis attacks bare patches inside the thighs and elbows.

The Dermatodectes ovis or "Psoroptes communis," is the common variety of the scab mite or itch insect.

Perhaps scab is more dreaded by flock masters than any other disease amongst sheep in this or any other country. So insidious is its attack, so intensely contagious, so ripid its course, so destructive its effects and so difficult is it to exterminate, that it has justly earned the distinction of being more injurious than any other disease caused by external parasites. It has been computed that in three months a single female would produce 1,500,000, the progeny of six generations.

Symptoms. Intense irritation, the animal continually rubbing and scratching himself, and licking the affected parts. The wool falls off or is drawn out, leaving bare irregular patches, the wool surrounding these patches being matted and easily removed. The sheep will often stand to be scratched. If the wool is shed and the skin examined a number of small vesicles are seen, and by rubbing, these are soon burst, the discharge from these vesicles irritating the surface over which it flows and finally scales are formed over the parts and if these be examined microscopically, the parasite may be found. The usual situation of this parasite is along the lateral aspect of the spine and chiefly where the

wool is thick, although it may be found all over the body. If the disease be neglected, by continual rubbing, pustules are formed the skin becoming inflamed all around the pustules. The animal stops feeding and loses condition. The visible mucous membranes appear pale and unhealthy and if no treatment be adopted, in two or three months the weakest of the flock will die.

Scab is easily transmitted to one sheep from another by actual contact, or by a sound sheep rubbing against some fixture where a diseased one has been before it.

The Treatment is of two kinds, viz: Preventive and curative. The first consists in using every possible effort to prevent healthy coming in contact with diseased animals by strict quarantine, keeping affected sheep from public highways where other flocks may pass, until the flock and all its surroundings have been thoroughly cleansed and the diseased cured. After treatment commences the sheep should be removed to a temporary uninfected yard and all wood work should be burned where practicable or washed with a boiling solution of caustic potash (one part in 200 of water) and afterwards lime wash used, to which is added some crude carbolic acid. In fact every secreting place for the insects should be thoroughly overhauled and after thorough cleansing should not be again occupied for three weeks or a month.

Curative Methods are of two kinds, viz: Pouring and dipping or submerging. The first is done by shedding the wool and pouring some anti-parasitic solution over the diseased parts. The second is by immersing the sheep, all except the head, in similar solutions. There are quite a number patent of dressings and dipping compositions of repute which can be used with safety. Prof. Law's recipe is the following: Take of tobacco 16 pounds, oil of tar 3 pints, soda ash 20 pounds, soft soap 4 pounds, water 50 gallons. This quantity suffices for 50 sheep. The tobacco should be steeped, afterwards the other ingredients added at 70 degrees Fah.

Another recipe is: Fleming's patent tobacco juice 1 gallon, brown hellebore 1 pound, soft soap 2 pounds. Boil the hellebore

with water and soft soap for 15 minutes, then add the tobacco juice and water to form five gallons.

The estimated quantity of dip for each sheep is from one quart to two gallons, according to the length of the wool. Sheep should be examined ten days after dipping and dressing repeated if necessary. The dipping should take place in dry weather and the sheep should be penned for the night after the operation to prevent them eating the drippings from the wool along with their food.

Sturdy, Gid, Turns'ck or Staggers.

This disease is due to the cystic form (the cœnurus cerebralis) of one of the tape worms of the dog (the tænia cœnurus), becoming located in the brain or spinal cord. The sheep becomes the host of this parasite by pasturing or drinking where dogs, wolves, or foxes have scattered the eggs in their wanderings over the country. The dog, etc., in turn getting the parasite by eating the brains of sheep containing the cysts, which undergo development in the dog into the tape worm, the tænia cœnurus. The eggs of the tape worm, after being taken with the food or drink, or hatched within the stomach of the sheep, and it generally believed, they find their way into the circulatory system and are carried through it to various parts of the body, but those arriving in the brain and spinal cord seem to thrive and grow best. The others grow for a time and then perish.

Symptoms.—About the first symptom is an aberration of the special senses, dullness, stupor, and an involuntary muscular movement. The affected animals are generally apart from the flock. The pupil of the eye is usually fixed; it may be contracted or dilated. Sight or hearing may be gone or it may not be affected. The animal has no inclination for food, and loses flesh rapidly. The eyes are red and congested. If the parasite is in the lateral aspect of the brain, the sheep turns its head to that side, and has an irregular action of the muscular movements of the opposite side of the body. If it is situated in the median line, the animal advances with an irregular jerky action of the fore limbs, but in the latter stages the power of movement may

be lost. Sometimes the head may be turned to the right or the left, and the animal describes a circle in that direction, but can't walk straight forward. When the cyst is located in that part of the brain termed the "Medulla Oblongata," there may be great difficulty in breathing.

If the cyst is superficially situated the portion of the bone over it, in about four weeks from the time the embryo has entered the brain, commences to soften and bulge out at that situation. In many cases the symptoms vary, some days they are better marked than others, which is believed to be due to some movement of the parasite.

To prevent this disease, no stray dogs should be allowed among sheep, and those dogs that are kept should be given some worm medicine occasionally, and should on no account be allowed to eat sheep's brains uncooked. The heads of the sheep that have died or been slaughtered should be either cooked, burned or buried and not thrown carelessly away.

An operation can be performed when the bones have become softened, but before this has taken place very little can be accomplished.

The operation is called "craniotomy," and is performed as follows: Remove the hair or wool over the elevated bones, pierce the bone with a grooved needle, puncture the cyst with a trocar and canula; remove the trocar, and through the canula with a small syringe, draw off the fluid; then withdraw the canula, and with a pair of small forceps remove the cyst wall. More than one cyst may be present and each one has to be taken out separately. Afterwards treat the opening antiseptically, or with stripes of pitch plaister.

COWS.

Parturient Apoplexy, Milk Fever or Dropping after Calving.

None of these terms indicate perfectly the character of this disease, but as it is perhaps most popularly known as Milk Fever, I shall use that term here. It is astonishing the numbers of animals that have succumbed to this disease, left to themselves either to recover or to die on account of the confusion that has hitherto existed as to its nature, but now this confusion has been, to a very large measure, cleared away by the careful research of intelligent workers in the field of veterinary science, and we can now look upon Milk Fever as a disease the pathology of which is pretty well understood and over which we have control sufficient to warrant the expectation of success in its treatment.

Milk Fever is believed to be a brain affection, apoplexy resulting from an excess of rich, nutritious blood, which supplied nourishment to the young before birth, instead of being diverted to the mammary gland or udder, when the mother is delivered in order to supply material for the secretion of milk, is suddenly thrown on to the vascular system of the parent, causing engorgement or congestion.

Some veterinary writers held the opinion that the disease was due to peculiarities of anatomical conformation, but this theory does not seem to hold good when we consider that Milk Fever is almost invariably inseparable from domestication and stimulating food. It is peculiar to deep milkers, scarcely ever

succeeds difficult parturition, and scarcely ever occurs previous to giving birth to the third calf.

This disease may affect any female animal, but the cow undoubtedly is more susceptible than any other. Other authorities say that this condition is brought about by the peculiarity in the arrangement of the blood vessels in the brain of the cow, but there are a number of breeds that are almost exempt, such as the Galloways, the long horned West Highland Scotch cattle and some others. The reason for this is, their vascularity is not so great, or, in other words, they do not secrete so much milk. Bad milkers are almost exempt. The disease, then, may be said to be confined to those breeds of cows that are deep milkers. Aryshires are particularly liable, then the Channel Island breeds, Jerseys and Alderneys; then the Shorthorns. Holsteins, although great milkers, are said to be comparatively free.

One of the direct causes may be sought for in the act of parturition itself, as it is always accompanied by more or less excitement, which has a weakening effect upon the nervous system, and consequently there is an unequal distribution of blood in the blood vessels of the brain; post mortem examination revealing congestion of the veins and an anæmic or bloodless condition of the cerebral arteries, with large quantities of the watery constituents of the blood (the serum) in the cavities of the brain.

Another and very common cause is feeding highly stimulating food to a pregnant cow right up to her time of calving. This practice is often indulged in by dairymen and others for the purpose of getting cows in a fat condition at the time of parturition, but it ought to be borne in mind that cows of large milking capacity, previous to giving birth, when dry or nearly so, very rapidly take on a full habit of body, the blood vessels becoming charged with blood, and that this plethoric state of the body at the time of giving birth is a condition which favors this disease.

Disturbance of the organic system of nerves is no doubt the cause of the stoppage of the milk secretion, but it is difficult to determine how this arises, unless we consider that the great sympathetic nervous system is more largely developed in deep

milkers than in other cows, and consequently it is more prone to derangement from slight causes at this critical period.

The germ theory of disease has made very rapid strides of late years, and it is not outside of the bounds of possibility that a specifiic organism may yet be found to be the potent factor in the causation of Milk Fever, as in many other diseases; still we know, even at this present time, that its ravages can be cut short by strict attention to prophylactic measures and to the physiological requirements of the animal previous to the act of parturition. We say, then, that cows rarely become victims to this disease previous to the third calf, but having once been affected are more susceptible to subsequent attacks. Certain breeds are more liable to it than others; full habit of body, easy calving and bad hygienic surroundings are predisposing causes. Middle-aged animals are more liable on account of their milk producing powers being greater than in the young; the functions of the nerves are more active and consequently are more easily deranged. Conditions of the atmosphere, both hygrometric and thermometric, at certain seasons seem to predispose to the disease, so that a number of cows may be attacked at the same time, leading to the supposition that some outbreaks are contagious. At all events it is difficult to account for (in our present knowledge of the subject) the speedy attack and quick departure of the disease, unless atmospheric influences render some explanation for such an occurrence.

Symptoms.—We might say that the first thing to arouse our suspicions is the breed of the animal peculiarly susceptible to Milk Fever, with the large udder indicative of a deep milker, about to give birth to her third or subsequent calf. From 12 to 48 hours after an easy delivery we find something wrong; the cow becomes very uneasy, moving from one hind leg to the other; there may be a certain amount of liveliness and nervous excitement; frequent twitching of the eyelids and movement of the ears. Now and again grinding of the teeth. There may be early loss of power and the animal sinks down at the hocks and hind fetlocks and ultimately falls down altogether.

The milk secretion is stopped. The horns and ears are

intensely hot. The breathing is hurried and the cerebral excitement may now be conditional, the patient may be either in a state of coma or the excitement may be so great as to endanger the animal's life by dashing its head about in a state of frenzy, with wild, staring eyes and tears flowing profusely.

In the comatose condition the head is often carried back to the chest, or the neck may be stretched out; the pupils of the eyes widely dilated; insensibility to light or touch. The legs may be straight out from the body. If the head be lifted it may fall back upon the neck or on the ground, as if perfectly inanimate. The lower jaw opening and closing, or the cheeks may puff at every breath. The breathing is stertorous or snoring. The power to swallow is lost. Hearing also is gone.

Tympanites, gas in the stomach, is invariably present. This results from fermentation of the contents, on account of the function of the organs of digestion being suspended. The operations from the bowels and the urine may be passed involuntarily, but in most cases the bowels are locked up, being paralized as also the sphinctar of the bladder. Death may take place very quickly or it may be gradual, one center after another giving away.

The cows should be placed in the natural recumbent position on the breast bone and supported by means of straw or sacks filled with straw and packed on either side. The condition of the pulse varies. In a robust animal, and in the early stage, there is generally a hard, full pulse, but after the disease has been in existence for some little time, it becomes quick and frequent.

Should signs of consciousness return, the stertorous breathing stop and become more natural, the eyes appear more intelligent, the ears begin to work, the head lifted a little and other signs of convalescence set in, we are inclined to look favorably on the chances of our patient, but frequently these buoyant signs are unfortunately followed by a return of more aggravated symptoms and death closes the scene.

Treatment—Every person owning cows belonging to certain breeds which are known to be susceptible to Milk Fever, with large udder indicating large milking powers, and more

especially at the third and following times of calving, should use every effort to *prevent* this disease, as the results of preventive treatment are much more satisfactory and followed by greater success than curative measures.

Considering, then, the causes that in most instances predispose to Milk Fever, it will appear evident the necessity of removing or guarding against any circumstance or influence that is known to stimulate the condition of body, which results in the disease. We know that, at this particular period in the life of a cow, there is a large amount of blood in the system from which milk is secreted to supply nourishment to the young, and if from any cause the udder fails to take on its function, this excessive quantity of blood, instead of being withdrawn from the system in the form of milk, is retained in the general circulation; and if an animal is fed on highly stimulating and nitrogenous food, in short, on rich blood forming food, this hyper-nitrogenous condition of the blood is aggravated and more fuel is added to the fire.

Having these facts in view, then, let us see what is best to be done to reduce the chances, so to speak, of such animals becoming victims to Milk Fever. Our object is to deplete the system in some way for a short period previous to parturition. This can be done by changing the rich nitrogenous blood-forming food to a more sparing diet; in fact, the animal should be underfed. The bowels should be regulated; a couple of pounds of molasses, with one ounce of powdered Jamaica ginger, will answer well, but should there be considerable torpidity, when signs of labor are first presented, a purgative drench should be given, composed of one pound of magnesium sulphate (Epsom salts) 10 to 15 croton beans powdered, and one ounce of powdered Jamaica ginger. The salts should be first dissolved in a little hot water, the other ingredients mixed in and about a couple of quarts of warm water or gruel added to form the drench, which can be administered with a strong bottle or horn. If the udder is congested it should be relieved by milking once every day or second day, as necessity requires. The animal should be kept comfortable, general exer-

cise given, avoiding damp beds or cold draughts, and should not be exposed to excitement of any kind.

Curative Treatment—In the hands of a competent person, or one familiar with the indications for its necessity, bleeding speedily relieves the tension in the general circulation and necessarily on the blood vessels of the brain. This operation is usually performed by tying a small rope round the lower third of the animal's neck to stop the flow of blood in, and to raise the jugular vein, which is opened with a fleam.

The conditions warranting this operation are: The animal must be robust and have a strong full pulse, when from three to five quarts of blood withdrawn from the patient may act beneficially, but should the animal be in the opposite condition, with a weak, small almost imperceptible pulse, bleeding would only aggravate matters by further impairing the already weakened action of the heart, and it must be remembered, as stated before, that the congestion or engorgement is more particularly confined to the veins and that the arteries are already in an anæmic or bloodless condition, and this case weakening of the heart's action is to be prevented by using stimulants to increase its action, to force arterial blood into the brain, and so overcome the resistance offered by the congested state of the veins.

As early as possible the cow should be placed in the natural lying position on the breast bone or sternum and kept there by propping with straw or hay, or sacks filled with the same; the head also should be kept well up so that the breathing can be performed freely and lung complications prevented. This can be done by placing a sack of hay or straw for the head to rest on, and the latter kept in position by fixing a rope to each horn and tying it to the sides of the stall.

In all cases it is important that the bowels should be made to act and a full dose of purgative medicine should be administered; the formula already mentioned will answer here also, but before drenching the animal, precaution should be taken to find out if the patient can swallow, by first giving a swallow of water. Should there be difficulty, the drench could be given by means of

a stomach pump, or piece of hard rubber tubing smoothed and wrapped with some soft material at the end to prevent injuring the gullet and the medicine poured through the tube; but the passing of such an instrument requires practice and should only be undertaken by some one who is familiar with the operation. Tepid enemas may be given to assist the action of the purgative. Cold water to the head should be applied by fixing a piece of sacking or cloth of some kind to the horns and keeping it continually wetted with the cold water. The body should be quickly sponged over with dilute acetic acid and water, or vinegar and water; have a rug or blanket, which has been dipped in cold water, ready to put on, then put two or three dry blankets, rugs, or sacks on top, to induce perspiration, and in this way attract more blood to the surface of the body and keep it away from the brain. In changing the wet blanket every caution should be taken to prevent the animal getting chilled, as that would tend at once to drive the blood inwards again from the skin, which might result very disastrously. The patient should be turned from one side to the other every two or three hours and propped or packed in position. The udder or bag should be stripped or handrubbed at intervals to try and stimulate it to action.

Tympanites, bloating or enlargement on the left side from gas in the paunch is almost invariably present and should be speedily relieved. This is best and safest done by introducing an instrument for the purpose, called the trocar and canula, directly through the skin into the stomach. The place to operate is on the left side at a point equidistant between the posterior border of the last rib, the point of the hip and the bones which project transversely from the spine at the loins. The trocar and canula are both introduced at once, the former withdrawn and the gas allowed to escape through the canula. Should the free passage of gas be obstructed by some solid matter getting into the canula from the stomach, it can easily be cleared by passing the trocar again through it. In the early stage of the disease, bromide of potassium is a very useful medicinal agent given in half or one ounce doses dissolved in about half a pint of water

every four or six hours. This drug has the action of paralyzing the nervous centres which control the blood vessels and it abates excitement. When convalescence has fairly made its appearance stimulants and tonics should be administered. Many deprecate the use of alcoholic stimulants in this disease, but I think general experience teaches that the careful use of good whisky has proved to be very efficacious, about an ounce mixed with one pint of water or gruel at intervals of one hour, or as the case may seem to require. After recovery powdered nux vomica may be given for a time in one to two drachm doses (½ to ¾ of an ounce) twice daily. This medicine can be made into a large pill or ball with a little meal and butter, and with the assistance of some one to hold the mouth open can be passed over the back of the animal's tongue. The food should be simple and of an easily digestible nature.

As Milk Fever is apt to recur at a subsequent calving, it is perhaps the safest plan not to allow the animal to again become pregnant, but to fatten her off.

Abortion,

Premature expulsion of the fœtus or young calf. There are two varieties, viz: *Sporadic* and *Infectious.*

In the sporadic form one pregnant cow gives birth to a calf some days, or it may be months, before the normal period, and there the disease stops, but in the infectious form one cow after another is affected, it may be for years, until it is impossible to get an animal to carry her young the full period of gestation.

The occurrence of one cow only slipping her calf may be very easily accounted for, such as excitement, sudden fright, either at pasture or in the stable, injury by being thrown down, excessive doses of purgative medicines, injudicious feeding and especially large draughts of cold water in cold weather—some varieties of pasture, such as ergotted grasses or grains. Any of the foregoing may cause occasional cases of abortion which may appear at any place or at any period during pregnancy. In the infectious form all the causes mentioned may be at work

in causing the first case, but the subsequent cases are undoubtedly due to some infectious process. In fact, some European authorities, Prof. Nocard one of them, have shown by their investigations that this contagion consists of one or more micro-organisms, which apparently originate in the womb of cows that have aborted. These investigators have isolated and cultivated the specific organisms obtained from the cow's womb, as also from the intestines of aborted calves. Further proof has also been given of the contagiousness of this form of the disease, by introducing experimentally into the genital passage of pregnant animals the discharge from cows that had recently aborted, and caused abortion, but when the uterine discharge from healthy animals that had gone their full period was introduced into the genital passage of other cows, no such results took place. It has not as yet perhaps been positively ascertained whether the infective material is absorbed into the system, or has only a local action, but it is a fact that if one animal slips her calf and she is allowed to stand among other pregnant cows for a time afterwards, several others will directly follow. The first indication may be the presence of a partially developed calf found on the pasture or in the stall; the symptoms generally are so slight as to escape observation If the animals are very closely watched, there may be slight slackening of the quarters and congestion of the vulva for several hours before parturition, but this even is sometimes absent. Having the confirmatory evidence, then, of these scientific investigators as to this form of abortion being caused by specific organisms, the *treatment* to be adopted should be preventive, the destruction of the organisms, if possible, to prevent their progation and spread.

At once isolate all the affected animals and burn or disinfect and deeply bury the aborted calves and the after-births, which should be removed as soon as possible; the straw, litter, excrement and discharges which have been in contact with the animal should also be destroyed. The cow's womb should be washed out with antiseptic solutions such as the following: Pure carbolic acid, one ounce; glycerine, eight ounces; water, two

quarts; mix. Another: Corrosive sublimate, one part; common salt, forty parts; water, four thousand parts; mix. Either of the above can be introduced with a syringe having a smooth nozzle, and repeated once a day for two or three days. About one gallon of the corrosive sublimate solution can be used for each injection.

Should there be a continuance of the discharge from the cow which has aborted the parts should be subsequently washed out with about a quart of the same solution until it has stopped. All the pregnant animals in the same house or herd should have antiseptic medicine given internally, such as the chlorate of potash one half ounce, either dissolved in water or mixed with the food, or the hyposulphite of soda, about one ounce administered in the same way and repeated twice daily. It is advisable also that they should have a daily vaginal injection of about one quart of the corrosive sublimate solution and the root of the tail and contiguous parts sponged with the same solution to destroy the germs. Daily exercise should be given if possible to animals that are kept in doors, but if that cannot be done, they ought to be kept continually tied up, as often when allowed exercise after being confined in a stable for a length of time, the excitement caused by their freedom may of itself bring about abortion.

It is of the utmost importance also that stables or houses in which the affected animals have been should undergo thorough cleansing and disinfection; the floors should be scraped, swept and sprinkled with chloride of lime—a 2 per cent. solution of carbolic acid and water, or a 4 per cent. solution of copper sulphate and water. All the woodwork, stalls, posts, and so forth, should undergo a like over hauling and disinfecting.

A cow that has once aborted is very liable to have a recurrence, and it is perhaps best, therefore, not to have her again impregnated.

Mammitis, Garget, or Inflammation of the Udder.

This is a common disease amongst cows, especially those in

a plethoric or full-blooded condition at the time of calving, when the udder or bag is in a high state of activity, or if they are turned on to rich pastures at this period, the nutritious grasses acting as a stimulant to the gland which is already in a state of congestion.

The mammary gland or udder of the cow is composed of two symmetrical halves placed one against the other. Each half is divided into two distinct glands and each with its own teat so the udder consists of four glands or quarters and four teats. In the center of each quarter just at the base of the teat is a large cavity or sinus, the general receptacle of all the milk conduits. From this cavity, which is sometimes large enough to contain a quart or more, proceeds down the centre of the teat one definite excretory canal. The function of this organ is to secrete milk, and being complex in its structure is very liable to be deranged if its powers of secretion or excretion are interfered with.

Mammitis assumes several forms, but to the uninitiated it might be a matter of difficulty to distinguish between them. So we shall use the general terms, Mammitis or Garget. Rarely does it involve the whole bag but is confined to one or more quarters; the condition is expressed by swelling, pain, heat and redness of the part. In the first stage a shivering fit is often observed, which is quickly followed by fever and dullness. The milk is decreased, and the animal is averse to being milked on account of the pain produced by handling the udder. The bowels are generally disordered, often constipated. Swelling of the gland succeeds; it becomes hot and painful and if milk is withdrawn it may be tinged with blood, subsequently the quarter may become hard and tumor-like and may soften and fluctuate, due to pus or matter forming which may discharge through the teat, or an abscess may form and burst externally. Very frequently the exudation formed in the substance of the gland destroys its powers of secretion, by blocking up the little milk ducts and cavities, and the whole of the structure of the gland becomes a hard fibrous mass. During the inflammatory stage of this disease the cow becomes very uneasy. Keeps moving from one

hind leg to the other, the legs being kept out from the udder as much as possible to prevent pressure on it and for the same reason she is not inclined to lie down.

The more frequent causes of Mammitis are careless handling of the bag. Imperfect milking, allowing some of the milk to be retained, which becomes curdled and acts as an irritant. Calves requently produce it by roughly sucking. Exposure to cold. Cold damp beds. Currents of cold air. Sudden changes of temperature. Direct injuries. Feeding over-nutritiously at certain periods, thereby excessively increasing the lacteal secretion and leading on to congestion and inflammation.

As Preventive Measures, the milk should not be allowed to remain in the udder more than six hours after parturition, for a short period of time. Allow warm, dry beds, and avoid cold draughts in every way. When the disease has manised itself have the animal placed in a sheltered stable or building with a dry, comfortable bed, and give the following drench: Epsom salts, one pound ; molasses, one pound ; Jamaica ginger, powdered, one ounce; water or gruel, two quarts. Restrict the diet. Gruels should be given in moderate quantity, such as linseed or hay tea, which can be made by pouring boiling water over some good hay in a large bucket, and when cool the liquid can be poured off ; or scalded bran.

It is not advisable to give meals. In fact nothing should be allowed the animal that would have a tendency to form milk.

If the fever still continues after the purgative has had time to operate give a fever drench composed of nitrate of potash (saltpetre), one ounce; Fleming's tincture of aconite, fifteen drops; water, one-half a pint; and repeated at the end of four hours.

Locally to the udder should be applied hot fomentations. This treatment is very important. The milk ought to be drawn frequently and the gland carefully manipulated. If it is impossible to extract milk by the hand, a milking tube or teat syphon should be used. If this is not obtainable a small-sized catheter

will answer the purpose. To reduce the local congestion an astringent lotion may be applied, composed of acetate of lead (sugar of lead), one ounce, dissolved in one quart of water, and sponged on to the gland milk warm ; or a solution of nitrate of potash and water is also useful.

If the udder should become much swollen it out to be supported by means of a broad bandage made so as to take in the whole bag and fastened over the back. This will relieve the patient of the excessive weight of the organ. Holes can be made in the bandage to allow the teats to come through, so that in milking it will not require removing for that purpose. It may also contain a poultice, if necessary, composed of bread and milk, boiled turnips, scalded bran or flaxseed meal.

The udder should be carefully rubbed with dressings such as the following : Three drachms each of pulverized gum camphor, extract of belladonna, extract of henbane and eight ounces of vaseline ; mix to form an ointment and apply with gentle friction.

Pulverized gum camphor, one ounce ; methylated spirit, four ounces ; olive oil, one pint ; mix to form a liniment and apply as above.

If suppuration sets in and abscesses form they have to be opened to allow the pus to escape and the wounds dressed with antiseptic lotions, as : One part of pure carbolic acid, four parts or glycerine in forty parts of water ; or chloride of zinc one drachm, and water 20 ounces.

Very often the gland becomes hard or indurated, in which case agents should be employed to stimulate absorption, and for this purpose an ointment composed of the following will be found efficacious : One drachm each of iodine and iodide of potassium, with four ounces of vaseline. This to be applied with friction.

As an advanced stage of mammitis, gangrene may set in, and the parts become mortified and may necessitate the removal of the dead portion by incision, or it might be circumscribed by running a sharp edged hot iron round it. Nature, however, always

trys to get rid of any dead matter which is then foreign to the part, by sloughing, and if time were allowed and assistance given her by repeated poulticing of the part, the separation of the dead from the living tissue could be easily effected by moderate traction—the wound afterward kept sweet by deodorizing and disinfectant agents, the general health of the animal looked to and her strength supported by good food and stimulants.

In this advanced stage of the disease, however, it would be advisable to commit the patient to the care of some one properly qualified and competent to undertake the necessary treatment.