

The two posterior processes to which I have referred were apparently of the same substance as the outer tunic. They were broadly conical at the base, which was about $\frac{1}{3}$ of their total length; the outer $\frac{2}{3}$ were very much finer and narrower, and covered with minute dots, which, Mr. Haswell says, were probably minute spines. In the interior of the base of each was a very strange mushroom-shaped object, of which Mr. Haswell says he does not know its precise nature, though he knows it to be as I described in my letter to him. When I sketched the process, or horn, I noted the mushroom-shaped object as coloured metallic green, but if I recollect right it was of the same bright purple as the nerve ganglion, etc., when the animal was first caught.

I have not been able to find any detailed account of the *Salpae* in the Society's Library, but in the Proceedings of the Boston Society of Natural History, Vol. XI., p. 17, is a detailed description, with woodcuts, of *Salpa Cabotti*, by Alexr. Agassiz. This is found south of Cape Cod, and very closely resembles the one I caught, and the description and investigation into the connection of the chain forms are highly interesting.

CANCER IN CATTLE.

[Paper read before the Royal Society of Tasmania August 11th 1884,

By H. A. PERKINS M.D., Edin.]

The subject of disease in cattle is one which cannot fail to interest all sections of the community, as well the stockowner who provides for the market as the inhabitants of towns who consume the meat, and to whose advantage it must be to obtain the most wholesome supply of food. At a time when cancer among human beings has *been said to be on the increase, the nature of such disease among cattle not only merits attention at the hands of veterinary surgeons, but furnishes material for speculation to medical men. For in these days of minute organic life, of micrococci and bacilli, at a time when so many diseases find advocates for their origin and development in the theory of contagious living organisms, it might be a fair deduction to draw that the disease in man derived its prevalence and potency from living spores transmitted from the diseased meat which we colonists so unsparingly consume. The more especially as specimens of such disease called cancer in cattle are neither few nor hard to find, and the description of Osteo Sarcoma which I am about to give, is based on examples obtained in Tasmania. "The time has

[*Statistics of last 14 years show that though there has been an increase in the number of deaths from this cause, yet that the population has increased in nearly the same ratio.]

passed for the question of germ genesis and propagation to be considered as matter fitting only for the diversion of scientists," (**Lancet* June 21 1884.) Osteo-Sarcoma, or what is called cancer in cattle, is a disease affecting the lower jaw in most cases, and on very rare occasions the upper jaw, is most frequently met with in steers, cows, and bulls in the order named between the age of two and six years. The favourite side of origin of the disease is at the second or third molar teeth.

When first presenting itself, it causes an apparent thickening of the bone, attended later on with a globular or ovoid swelling gradually enlarging beneath the skin. The swelling is most prominent on the inner surface of the jaw. At first the skin moves freely over the tumour, but in advanced stages it becomes adherent to the bone, and is with some little difficulty removed or scraped, off. Should the parts be struck and inflammation ensue, ulceration of the skin takes place, exposing a raw surface, and at later stages, openings or fistulae are formed, leading to cavities within the medulla of the bone; through these openings, a discharge of more or less pus is continually taking place. Eventually, great pain is felt on mastication, and as the bones become further involved, the teeth drop out, ultimately, if not slaughtered, the beast perishes from exhaustion and emaciation. These tumours occupy months, and even years in their development, the soft tissues become changed into a dense mass of fibrous tissue, and the bone is converted into a porous-body, large cavities enclosing thin bony plates. In order to obtain a section of the bone, removal of one or two teeth is necessary, and then it will be seen at once on sawing through the bone, that the appearances presented are very different from those of healthy bone.

The specimens shown were one of the lower jaw, and two of the superior maxilla, the disease in the last extending from the orbit, and showing well the honey-combed appearance of the eroded bone. In a healthy jaw, the boundary lines of compact or hard tissue and soft spongy bone are well marked. In the diseased bone, the soft spongy tissue at the root of the tooth, or in other words, the marrow is broken up and subdivided by numerous trabeculae of bone which surround cavities containing a soft, red pulp; the outer hard casing of bone is so expanded and invaded by these deposits, that the landmarks of hard and soft are obliterated, and the substance of the bone is partitioned into divisions or islets of various shapes, and marrow and bone, or rather soft material and bone become intimately intermixed. The effects of this disease may be seen in other organs and parts of the body. In the lungs soft circumscribed masses varying in size from a pea to a mandarin orange may be seen. On dissection these yield a green soft pulp like substance. In the liver white umbilicated deposits may be found of a triangular shape.

In the intestines traces also may be found. A gland attached to the intestine beneath the peritoneum yielded the same soft green substance, which exuded after its envelope was cut into. In the canal itself, just under the mucous membrane, and projecting into the canal were several small nodosities larger than a pea causing ulceration of the mucous membrane, and disclosing on section the green caseous material, spoken of before. Glands also in the vicinity of the jaw have been found to be enlarged, and their contents would

in all probability resemble those of deposits found elsewhere. The muscular tissue adjacent to the diseased jaw, has been examined by me, but I failed to discover any indications of morbid deposit.

The brain and eye I have not yet had an opportunity of examining.

A microscopic demonstration of the diseased bone, may be obtained by cutting as fine a section of bone as possible with an ordinary saw, further obtaining a thinner section than the first by means of a fret saw machine, and lastly filing this down to an extreme degree of tenuity.

A section obtained in this way is seen under the microscope on the table together with a specimen of bone obtained from a healthy animal. In the diseased or osteosarcomatous section, the lacunæ are enlarged and irregularly distributed in relation to the Haversian canals which are twisted and thrown across one another in different directions. It must be mentioned here that there are two sections of the bone one parallel with the ramus of the jaw and the other directly transverse, these different directions were taken with a view of showing the different relations of the lacunæ to the Haversian canals.

It is interesting in one of the morbid specimens to note the presence of triangular cells apparently occupying the mouth of the lacunæ, for these appearances are to be seen also in the soft green material of enlarged glands, where too may be seen ovoid cells with triple nuclei floating over the field in abundance.

The microscopic examination of the green material contained in one of the subperitoneal glands shewed numerous round cells containing two or three nuclei, the granular cell substance becoming clear on the addition of acetic acid, the appearances being identical with those of a section of tuberculous lung. Several large three-cornered cells containing nuclei were also noticed, and a dumb bell shaped cell like that of a crystal of oxalate of lime. The soft yellow matter from a secondary abscess in the jaw contained many thousands of round cells with multiple nuclei and all densely packed, showing activity of growth.

The cause of this disease has been attributed to a blow or to external violence. This cannot, however, be the real underlying cause, because in the first place where a blow is struck on healthy bone, the result, if any, would be otitis or periostitis or simple inflammation of the bone, which after a while would subside, or would only leave behind some innocent thickening.

Some explanation of the choice of site for the manifestation of the disease, may be found in these considerations:—

1. The head and jaws of horned cattle are more exposed to injury than other portions of their bodies—obstacles being often brushed aside by the heads or horns of beasts, and danger first confronted by the same parts. Further, it is well-known that when the disease breaks out in the upper jaw, it very often arises from the fact that a briar or thorn has scratched the upper or lower eyelid, given rise to subsequent irritation—provoked an open sore—and developed into a scrofulous growth by the continued irritation and rubbing which the beast has sought to relieve itself with.

2. Again, just as in man, the favourite site of manifestation of scrofulous disease is in the hip, so in cattle, it is quite probable that

the jawbone may be the favourite site selected, the more so, as it is a peculiarity of scrofulous diseases in cattle, that only one site is chosen as an external diseased centre from which the concomitant* disorders slowly spread.

We shall, I believe, more rightly attribute the cause to some unhealthy taint in the constitution, such as scrofula or tuberculosis—tubercle has already been found in the matrix of specimens and both Gangee and Williams attribute this disease to a tubercular diathesis. The Tuberculosis Board of Inquiry in Victoria state as one of the results of their investigation that the so-called "cancer" of the jaw "is in the great majority of instances a purely scrofulous affection."

Further in the neighbourhood of the growth, may be found examples of tuberculous nodules in the tissues adherent to the bone.

Again the microscopic appearances of the glands adjacent and of the tumours in the lung and liver found in cases of osteosarcoma coincide with the appearances seen in the same organs, when an animal is suffering from tuberculosis. Though I have examined several specimens, I have not yet come upon cells which in any way resemble those of cancer. Moreover tho' in advanced stages of osteo-sarcoma the soft parts are adherent to the bone, there is no general brawniness and adhesion of surrounding parts to the extent met with in cases of confirmed cancer. The presence of calcareous particles in the deposit is just what we might expect in cases of tubercle though not often, if ever, seen in cases of cancer.

* Willows Report.

| Colour and Sex. | Age in years. | Time affected. | External manifestation. | Internal manifestation. | Condition. | Remarks. How disposed of. |
|--------------------------------|---------------|----------------|--------------------------------------|---|------------|--|
| No. 1. Red cow. | 4 years. | unknown. | Osseous tumour on right lower jaw. | Slight caseous deposit in liver. | Good. | Was used as food in Hobart. This was the animal I procured specimen of Bone. |
| No. 2. Red and white steer. | 6 years. | 2 years. | Tumour on both upper jaws. | Osseous deposit on liver, lungs, & mesenteric glands. | Fair. | Used for pig's food. |
| No. 3.—Red steer. | 4 years. | 4 months. | Small tumour on left under jaw. | Slight caseous deposit on liver and fluke. | Good. | Used for dog's food. |
| No. 4. Red and white cow. | 5 years. | 2 years. | Large tumour on left jaw, ulcerated. | All the internal organs more or less infiltrated. | Medium. | Used for pigs. |
| No. 5. Red and white steer. | 5 years. | 2 years. | Very large tumour on both underjaws. | Extensive infiltration of liver, lungs & mesenteric glands. | Fair. | Used for pigs. |
| No. 6.—Red steer. | 5 years. | 3 years. | See No. 5. | Very little internal deposit of caseous material. | Fair. | Destroyed. |
| No. 7.—Red steer. | 5 years. | 2 years. | See No. 5 and 6. | See No. 6. | Fair. | For dogs. |
| No. 8.—Red steer. | 6 years. | 3 years. | Large tumour on left upper jaw. | Deposit on liver, lungs, & mesenteric glands, & fluke in liver. | Very good. | Used for pig's food. |
| No. 9.—White bull. | 3 years. | 1½ years. | Tumour on right under jaw. | Extensive infiltration in all internal organs. Flukes and parasites in mesenteric glands. | Medium. | Burned. |
| No. 10. Red steer. | aged. | about 2 years. | Both lower jaws affected. | Hydatids in liver and lungs, general manifestation similar to No. 9. | Medium. | Burned. |
| No. 11. Red steer. | aged. | 3 years. | Both jaws affected. | In liver, lungs, and kidneys were found calcareous deposits. | Very poor. | Unknown. |
| No. 12. White and red cow. | 5 years. | unknown. | Right upper jaw. | Portion of liver, lungs, and intestines, examined by myself. | Medium. | For food in Hobart. |

One conclusion is very clear after reading the result of Mr Park's *post mortem* examination, and that is, that the larger the tumour on the jaw and the more ulcerated it is, the more extensively are the internal organs affected.

It is probable that the deposits in the internal organs are secondary deposits and that the primary seat of disease is in the jaw. But it is easy to obtain many specimens of tuberculosis in lungs and other organs, in animals in which there is no outward manifestation of the disease.

Mr. Willows, in his report on Tuberculosis, printed by the N.S.W. Government, is inclined to attribute the existence of this pest in rabbits to the prevalence of tuberculosis, and in a minor degree of osteosarcoma in Tasmanian cattle. It is conceivable that in rare instances rabbits may have ingested some tuberculous matter, voided from cattle; but as rabbits are not carnivorous and living on succulent food, are not often seen to drink, this explanation does not appear to me to afford a sufficiently open channel for the dissemination of the virus.

It may be asked again, Whence did the cattle obtain their germs of the disease? Is it not more likely that the rabbits in their turn infected the cattle. We know that the disease exists among kangaroo. It is impossible, I believe, to say which order of animals first infected the other. Rather do we know that both among men and animals the germs of scrofula exist in abundance, that the disease has been handed down from time immemorial, and arising primarily we may surmise from a degeneration of healthy cells has been perpetuated by in-breeding, by over-feeding, and in some climates by the close confinement of cattle during the winter months, and that it is always ready to declare itself at certain critical periods in weakly animals, as for instance during the eruption of the molar teeth.

The evidence of Mr. Kendall, given before the Tuberculosis Board in Victoria is so important that I quote it in full from *Australasian*, Feb 1884, and will discuss some of his conclusions and recommendations. "Mr. Kendall considered the disease to be commonest among shorthorns. He had seen several cases of tuberculosis of brain and he differed from others, in considering ulceration of intestines to be comparatively common at least in calves, and in holding that the udder was affected in many cases. He saw little of this disease till about 3 years ago, but last year, 1883, he estimated that he had seen about 100 diseased animals living and dead. Had found it once in a native bear and in a baboon at the Zoo, but had not observed the disease in sheep, pigs, or rabbits. True cancer in cattle was rare, most supposed cases being really scrofulous diseases of the glands about the head and neck. The duration of the disease was very uncertain, and might be rapidly fatal or might last for years, an animal, perhaps, being fat even after a year. He thought the disease widely spread, and prevalent in the colony. The animals most frequently affected were Shorthorns and Ayrshires, and he lately saw a very marked case in an Ayrshire bull, which was being used for stud purposes. He considered that the scrofulous disease of glands was most common among animals of two to four years, while in calves the joints often were diseased. The disease called "foul" affecting the feet in old cattle, he considered to be

tuberculous, and had found it associated with tubercle in the internal organs. The disease was commonest of all among dairy cows. It was hereditary, and he had satisfied himself of this by tracing cases, and he had seen instances of congenital tuberculosis. This latter point he had verified by examining calves which had been dead born, and he had also found the liver and lungs affected, not more than a week after birth. Calves of tuberculous cows did better if put to a healthy foster mother, and he had known one do well whose mother died of the disease very soon after its birth. Tuberculosis was contagious and he had full knowledge in England of a herd in which the disease broke out and proved very fatal after a tuberculous bull was introduced into it. When questioned further, he stated that in that case, animals had all been constantly housed and under decidedly unhealthy conditions. He had seen calves and pigs previously healthy injured by consuming the milk of tuberculous cows, even when supplied with other good food, and he was satisfied that they acquired tubercle. He was not of opinion that there was much risk of contagion when animals lived in the open air, and had been puzzled to account for the prevalence of the disease in this country where stock generally lived under natural conditions. There was no connection between pleuro-pneumonia and tuberculosis, other than the possible production of a predisposition." He was of opinion that the disease might sometimes be spread by inoculation by mistake for pleuro-pneumonia by incompetent persons, but had known no cases. The chief cause of the prevalence of the disease in this country he thought to be hereditary transmission from affected imported stock. He had not had much experience among dairy cows but had seen cases and thought the disease must be common in the Melbourne dairies from casual observation of animals feeding in the parks and other places. He has not seen any authenticated case of children injured by the use of milk nor of adults from consuming tuberculous meat, but he had seen tuberculous glands still attached to meat exposed for sale. As to precautions to be taken he would have dairies inspected and all diseased cows slaughtered, as he believed there was risk from using the milk, even when the udder was not affected. The sale of meat need not be absolutely prohibited if the disease was slight. Even though the animal was in fair condition, if there were large cavities in the lungs from softened tuberculosis the meat should be condemned, and if the animal was in bad condition, whatever the stage of disease, it should also be condemned. There should be some freedom given to a competent inspector. Tuberculosis should be added to the list in the schedule of contagious diseases. All abattoirs should be inspected, and the expense need not be great as a constable or other non-professional person might be instructed, so as to be able to detect the disease. In large towns, the inspector might be and ought to be stricter. If the disease was to be checked, it could only be by killing off affected animals, this should be done at once when the signs are unmistakable, and the doubtful might be kept separate for a time and breeding from them prevented. Regular inspection of all stock he admitted to be impracticable, but he considered that all stud bulls ought to be kept under inspection. He believed that the introduction of fresh stock into the colony was desirable, but all animals should be inspected on arrival, and if necessary kept in quarantine till the absence of disease was estab-

lished. He would be prepared to recommend quarantine for 4 months in all cases as he did not think that very much value would be attached to certificates from the breeder or previous owner. If the animal was suffering in any way, quarantine might be prolonged with the right of appeal by the owner for consultation with a duly qualified veterinary surgeon. The question of compensation was a difficult one, but the witness thought that none need be given to the owners of home-bred animals having the disease in unmistakable form. With reference to inspection at the border, Mr. Kendall said that it ought to be strict, as many tuberculous cattle came from N.S.W. and Queensland. He was not acquainted with the present system, and if all the colonies could agree on some uniform legislation, inspection would not be necessary."

It will be noticed that Mr. Kendall attributes the prevalence of the disease to hereditary transmission as one of the chief causes. In Tasmania where there is so much in breeding, it is quite possible that constitutional diseases may be handed down from one herd to another until in a country of limited area like this island, we find after the lapse of years that the whole of the stock is more or less affected. Hence, the recommendation which all who are conversant with the subject make, is the introduction of fresh stock of hardier breed such as the Polled Angus into Tasmania from time to time, and this is all the more necessary when we come to consider that it is only at intervals during the last 25 years that fresh stock has been imported and then only in very small numbers.

2. Considering the prevalence of scrofulous and tuberculous diseases in dairy cows, it is desirable that all dairies should be regularly inspected, for we know also that no food affords such pabulum for the germs of typhoid and scarlet fever as milk.

3. In remote districts weakly cattle may continue to exist for a long period without interference. The prevalence of disease in such districts could be certified by a constable who could send for a qualified veterinary surgeon to inspect the herd.

4. It is undesirable that weakly or suspected animals should continue to breed or be at large amongst breeding stock. Hence the recommendation of Mr. Kendall's is a good one, viz. that they should be killed off. Further, the inspection of stud bulls has never been attempted in Tasmania, though every one will allow the necessity of it. A license is objectionable for an owner might be willing to pay a license for an unhealthy, though well-bred animal.

5th. Quarantine is of too short a duration to determine the existence of tuberculosis and scrofulous diseases. As it might take a year or more to develop such—and as other diseases, such as foot and mouth, and pleuro pneumonia make their appearance at most under three months, and the former much earlier, no good can be gained by prolonging quarantine over three months. Animals in quarantine who are manifestly labouring under some constitutional disease should be slaughtered at once.

5th. In all large cattle markets beasts are inspected by a competent veterinary surgeon. This is the case at Glasgow, and also at Deptford, where often at both places 2,000 cattle are put up for sale in one day. At these places cattle are inspected beast

by beast before being landed. Cattle are not examined by a veterinary surgeon before being put on board the intercolonial steamers, but they are inspected on arrival. It is often taken for granted in Tasmania that all beasts bred in the Island, and brought to the abattoirs are fit for human food, whether they have been inspected or not.

6th. That the milk of affected cows is prejudicial, seems beyond a doubt, for witnesses again and again attribute the death of calves to sucking the milk of such mothers; and it is absolutely certain that when the udder is tuberculous that the milk must contain the germs of disease in abundance. There can be no question that similar milk, even though diluted, must be fraught with danger to infantile life. We hear much of using the milk from one cow for children, but little care is taken to see that this cow is a healthy one; if the cow be unhealthy, the victimised infant will have a daily increasing dose of noxious food unvaryingly poured into its system. On other grounds such as the periodical occurrence of rut or heat in cows, more frequently in scrofulous cows, the milk of one cow only is undesirable, for at such periods the milk is deficient in nutritive elements, and would not be so good as milk obtained at regular intervals from two or three cows. As a precaution in dealing with suspected cases, milk ought to be well boiled before using. We may, however, be assured that did those who have the charge of infants know that the milk was likely to possess such characters, they would not use it at all. Some veterinary surgeons assert that they have seen evidence of tubercle in muscular tissue. It is with the muscles or beef that we are mostly concerned as forming the staple of our food. If an animal is in good condition, and the meat be well roasted or cooked before eating, there can be no danger of using it for food, provided there were no extensive marks of disease in an advanced stage present in the viscera. The raw meat and viscera of osteosarcomatous or tuberculous cattle should never be thrown to dogs or pigs. There are the same objections to this as to the general inoculation of rabbits with tubercle, as the raw meat ingested must present every facility for the escape of tubercle bacilli into the blood of pigs and dogs, and aid to disseminate tubercle far and wide. Though Mr. Kendall has not seen tubercle in sheep and rabbits, it has been observed in these animals by others.

SLAUGHTER YARDS.

Another recommendation to be made is the removal and improvement in the working of the slaughteryards or abattoirs. The choice of a more fitting site has already occupied the attention of the City Council. The chief requisites are besides being at a sufficient distance from town that there should be a good fall for drainage and abundant water supply.

Too much stress cannot be laid on cleanliness, and to this end it is desirable that the blood of slaughtered beasts should be caught in dishes or receptacles; at present the blood offal, etc., are allowed to stream on the floor and are washed away by water, but not by a sufficient force to carry all the refuse away, the consequence is that drains are choked and in warm weather decomposition from putrid remains is set up. All meat should be conveyed from the yards under proper cover.

Dogs may sometimes be seen wandering about when slaughtering is going on. When we can point out numerous cases of large hydatids of hard cartilaginous flukes and of tubercle spread thro' many of the viscera in the carcasses of slaughtered animals ready for human consumption, it is needless to say that no good can result from allowing dogs or other animals to appropriate morsels of the same. Though every expedition is made in the slaughtering of animals after arrival, it is desirable that they should be well fed, and if possible, allowed to graze in the interval. At present they are not well enough fed. In making these remarks I desire to say that the Superintendent uses every means in his power to enforce cleanliness, ventilation, etc., but until new yards are constructed, satisfactory results will not follow.

A suggestion I may make is the establishment of a hulk or floating sheds in the river as an abattoir, where drainage and cleanliness could be perfectly maintained. Animals should be yarded or enclosed on shore prior to slaughtering, and all diseased viscera and condemned meat burnt.

Lastly, all cases of diseased cattle within the city boundary should be reported to the Municipal authorities, or to a Government Stock Office ; and inspection should thereupon take place by a competent veterinary surgeon.

OBSERVATIONS ON SIX RARE FISHES RECENTLY CAPTURED IN TASMANIAN WATERS.

BY ROBT. M. JOHNSTON, F.L.S., ETC.

[Read October 13, 1884.]

During the last two months several new or rare species of fish have come under my observation, which I have thought desirable to bring specially under the notice of this Society. Mr. Morton has been praiseworthyly arousing the interest of local observers in various parts of the island, and it is to him I am chiefly indebted for three of the interesting forms examined and hereafter referred to. The Fishes on the Western, Northern, and North-Eastern parts of the Island are as yet imperfectly known. The recent discovery of the Snipe, or Trumpet Fish (*Centriscus scolopax*), at Port Sorell, by Miss Lodder, and the capture of the Moki (*Latris ciliaris*), so common in New Zealand, at George's Bay, by Mr. W. L. Boyes, lead me to hope that many new forms from these imperfectly investigated regions will soon be added to our list of Tasmanian Fishes. The following are the Fishes particularly referred to :—

FAMILY PERCIDÆ—Genus *Oligorus*.

Seven branchiostegals ; dorsal with eleven spines ; anal