PIG AND PORK: CYSTICERCOSIS (TÄNIA SOLIUM).

By BREVET LIEUTENANT-COLONEL W. K. MORRISON, D.S.O.,

Royal Army Medical Corps.

These notes are a sequel to the investigation into the question of cysticercosis and epilepsy begun by Major-General W. P. Mac Arthur, and are a result of the interest aroused and the knowledge gained during that investigation at the Queen Alexandra Military Hospital, Millbank, in 1933.

In those stations where it is easily obtainable pork is a very popular article of diet with the troops in the East.

If the diet sheet shows an occasional dish of roast pork and a weekly breakfast of pork sausages, the soldier feels he is being well catered for.

In one unit the average amount of pork consumed weekly was 500 pounds.

In some messes, both Officers' and Serjeants', it is a favourite dish. There are medical officers even who cannot resist a dish of sucking pig—trusting to the rarity of placental infestation with cysticercosis (Tänia solium) to protect them from acquiring the adult tapeworm.

That it is a popular dish with Anglo-Indians, and is consumed by Indian Christians and some members of meat-eating Hindu castes is confirmed by a visit to the local municipal pork market. This market is for the use of the civilian population, and the average number of pigs slaughtered is about 700 every year, while the average number of all other animals slaughtered for food in the same time is 162,000.

Pork is an expensive article of diet, and in this station (Bangalore) costs about 5 annas the pound; in the list of “Current Prices,” Moore Market, Madras, published by the daily press, it is given as 8 annas the pound. Some native servants in barracks state they are only too glad to get pork when they can, but the price is usually prohibitive.

With the lower classes the presence of “poochees,” “maggots,” “worms,” or “pearls” is no bar to the enjoyment of the delicacy. “We have seen these little white spots all our lives and they have never done us any harm!”

He who partakes of swine-flesh in the East must depend on the zeal of the regimental mess, or domestic cook, for safety from infestation with T. solium, as no pork inspection can guarantee freedom of the flesh from infestation with a solitary cysticercus or a few cysticerci.

At my very first inspection of pork on arrival at a new station in India 200 pounds of flesh were carefully examined and three cysticerci only were found and these were all in one carcase.

At a second inspection of another supply of the same amount, on this
occasion by multiple incisions in all directions through the carcases nine
cysticerci only were found and these were all in one carcase.

On one occasion pork was brought to a medical inspection room to be
"passed," prior to its sale in the lines of the married families. To a
casual inspection it looked all right—probably it had been wiped over with
a rough cloth. Incisions into any part of the flesh caused cysticerci literally
to fall out on the table. In one of the accompanying sausages eight whole
scolices were found! This pork came from a different piggery several miles
distant from that which supplied the two first mentioned carcases.

This incident led to the following conversation with the Indian manager
of the piggery concerned:—

"You did not know the medical officer had been changed to-day?"
"Oh! No, Sahib!"
"Had you known you would have sent good pork?"
"Yes! Of course, Sahib!"

On a very first visit to an official civilian pork market more than three
hundred miles south of the previously mentioned piggeries, examination
of one of the two "English" carcases for sale, revealed a severe infestation
with cysticercosis, and with the "inspection mark" on the hide it was
purchased at 5 annas the pound!

CYSTICERCOSIS (T. solium) IN THE LIVE PIG.

In the South of India two types of pig are offered for sale, the small
country pig and a much larger animal, a cross between an English boar
and a country sow, which is called "English" pig, and is sold by some, if
not all, native dealers, as "English" pork, ham or bacon.

Infestation of the Pig.—It is no uncommon sight to see the Indian
domestic pig wandering around the native villages and fields. In the
towns pigs may also be seen wandering in the vicinity of dwellings. The
pig may consume whole tapeworm segments, and that these are present in
the vicinity of piggeries is confirmed by the heavy infestation of individual
carcases seen at two stations several hundred miles apart.

That infested pigs are present in normal cantonment limits cannot be
doubted, and this was proved in one station by the fact that the pet cockers-
spaniel of a local Indian general practitioner died with all the symptoms
of hydrophobia. Examination of the brain and the muscular tissues
revealed an intense infestation with cysticercosis (T. solium).

It is not the custom of all piggeries to confine the pigs in one
compound, and in one case where the piggery was scrupulously clean, and
the manager insisted that his pigs never left the compound, it was found
that they made daily trips to a tank about a mile away for watering
purposes. The route for the mild infestation of the pig with one or a few
cysticerci can only be surmised.

The fact that the unborn pig may be infested with the onchospheres
through the maternal circulation is not generally realized, though it is stated in medical literature that five such human cases have been recorded.

The life of the domestic pig in India is a short one, and is placed at between one and a half to two years. It is of interest to note the age, because questions addressed to the Indian managers of piggeries on the subject of the diagnosis of the disease in the live pig do not bring out the classical symptoms, viz. muscular weakness, breathlessness, pyralism, tooth-grinding, convulsions, etc. The only symptoms elicited so far have been "restlessness," "irritability" ("bobbery"). These may correspond to the stage met with in our human cases of "acting queer," etc.

It is almost certain that a good pig dealer knows an infested animal "on the hoof," though naturally he could not be expected to recognize the condition unless the infestation was a heavy one or was so localized as to produce special symptoms.

On one occasion a pig dealer offered to provide a specimen for the College Museum. The same dealer, be it noted, who by mistake subsequently provided the excellent specimen of the eight scolices in one sausage. On the appointed day, in one corner of his piggery stood a dejected looking animal waiting the signal for slaughter. A minute inspection of the whole carcase failed to reveal a single cysticercus. The amused satisfaction of the owner and his many relations convinced one that he knew the pig was ill, and that it was not ill from "measles." At the finding of the carcase with nine cysticerci it was explained that the owner was away that day and that the selection of the live pigs was carried out by an underling, who did not have the knowledge and experience of the owner.

Cysticercosis (T. solium) in the Slaughtered Pig.

Cysticercosis in the pig and in the cow is well known to Indian dealers. The names they apply to the condition in the slaughtered animals are singularly descriptive: "moti muwafiq," like pearls; "jowari muwafiq," like barley grains; "poochees," small insects; "maggots"; "worms."

In the flesh the cysticerci appear as: Small white seeds, seed pearls, barley grains; small dirty greyish-yellow cysts of various sizes with a central or terminal white spot (the scolex); small gelatinous-like objects; small yellow pimplies or pustules; small yellow tubercles; occasionally as small bluish spots, showing up through the muscle fibres.

The cysticerci were either in between the muscle fibres, on the surface of muscles, or in between muscle groups. None was seen in the subcutaneous fat.

The carcase might contain from one or two cysticerci up to any number.

(Note.—On one occasion in the whole of the ration beef for a regiment for one day three cysticerci (T. saginata) were found and these were all in one carcase. On another occasion, even after the inspection of the ration beef, the regimental medical orderly brought a cooked specimen to the medical inspection room which he had dissected out on his own plate.)
Inspection of Pig Flesh.—This can be of value only when the individual carrying out the inspection has a clear idea of what he is looking for and where he is likely to find it. Theoretically the inspection should entail the cutting up of the carcase into slices of not more than five millimetres thick—even then a single cysticercus might be missed.

The nearest practical solution would appear to be multiple incisions through the carcase and the use of the flesh as sausage meat, but sausages are more liable to be imperfectly cooked than roast pork!

Practically the efficient inspection of pig flesh to exclude cysticercosis altogether is impossible, and one must fall back on efficient cooking for perfect safety from infestation with *T. solium* in the East.

To carry out the inspection the carcases, or better the half carcases, are placed on a table in a good light. The first part to look at is the inner wall of the thorax, a search being made for the little yellow tubercles in the intercostal muscles. Then all the muscular tissues should be inspected. Next the inspector should take a sharp knife and incise along the axis of the muscles of the gluteal region. If the flesh is for roasting a minimum amount of damage should be done. Incisions are then made into the large muscles on either side of the vertebral column, and the fibres separated here and there, then the shoulder and neck muscles are similarly examined.

A glass of water should be at hand—pieces of fat or tissue will be frequently under suspicion as possible cysticerci. The former will float on the surface of the water, while the cysticerci will sink to the bottom.

If it is desired to examine the scolexes under a microscope, one may be pressed between two slides, when the head with its hooklets is usually exceptionally well demonstrated.

To preserve specimens of cysticerci for subsequent demonstration these should be dropped into a small bottle containing glycerine.

SUMMARY.

1. Infestation of pig in South India with cysticercosis (*T. solium*) is not uncommon.
2. Such an infestation may be from one or two parasites up to any number.
3. Practical inspection of pig flesh should be followed up by thorough cooking.