Pig Bel

Pain in the belly caused by the eating of contaminated pig meat

Almost unique to PNG

In the early 1960s the 3 million or so inhabitants of the Highlands of PNG spent a lot of their lives fighting each other.

From time to time there would be a time of peace called and the neighbouring clans would come together for dancing and to have a feast during which many pigs would be slaughtered, cooked and eaten.
Houses built by the host clan to accommodate visitors for the pig feast

Preparations are being made to butcher and cook the pigs

Pigs being killed

Butchering in progress
Meat and sweet potato are wrapped in leaves and put in a pit into which hot stones have been placed. Water is added via a bamboo.

Cooked pig is carried away to another village to be eaten a few days later. It is cold at night but quite hot in the daytime.

In the weeks following these feasts there would be a number of people, mainly children who presented at the hospitals with symptoms and signs of intestinal obstruction.
When the abdomen was opened there were loops of small intestine in which the bowel wall was thickened, there was peritonitis, some loops of bowel were stuck to each other and sometimes fistulae occurred between adjacent loops of bowel.

Loops of normal bowel were present between the lengths of pathological bowel.

When the bowel was opened the mucosal changes were segmental as well.

The mucosal surface was inflamed and showed variable amounts of ulceration.

Small green or black spots could be seen on the mucosal surface and these coalesced into larger areas of ulceration.
Longitudinal sections of the bowel show the changes more clearly.

Going from normal bowel (left end of the next image) the wall is thickened.

There is submucosal oedema and then necrosis of the superficial mucosa, leading on to coalescence of small areas of necrosis to larger areas of necrosis.

Towards the right end of the specimen the black areas are areas in which there is full thickness necrosis of the bowel wall.

These changes can be compared with the microscopic appearances.

At the edges of the infarcted bowel there is marked endothelial proliferation of the veins to the point that they are almost completely obliterated.
The obliteration of veins is better seen in an elastic stain (VVG)
C. perfringens type C organisms were found in surgical specimens and on the ground where the butchering was done.

Burroughs Wellcome made a vaccine to the C. perfringens

Army medics did the vaccinations.

Greg Lawrence conducted field trials of the vaccine.
The vaccinations were accompanied by some changes to the method of butchering of the pigs and the overall nutritional state of the population.

This resulted in the almost total elimination of Pig bel.

A similar disease was produced under controlled conditions in guinea pigs.

Greg Lawrence did the experiments and I did the pathology for him.
This led to the general hypothesis about the aetiology of Pig bel.

It occurs in a population that normally exists on a vegetarian diet.

This results in a decrease in protease production.

When they suddenly have a protein meal that is contaminated by Clostridial exotoxin, they cannot detoxify this protein.

The effect is accentuated if the non protein part of the diet contains anti protease activity, as does the sweet potato that is the staple diet in New Guinea.

In the 1990s it was found that Pig bel occurred in the rural population in Viet Nam.

The conditions that existed there were very similar to those in Papua New Guinea in the 1960s.