



Risk factors and lingual prevalence of porcine cysticercosis in the Lake Kyoga Basin in Uganda

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Abstract

The predisposing factors to and the prevalence of porcine cysticercosis have not been extensively studied in most parts of Uganda. Most reports have been abattoir survey based. This could have not been representative, since lingual screening was sometimes done by traders before purchasing pigs for abattoir slaughter. A survey was therefore conducted around Lake Kyoga where pig farming and trade had been popular. Lingual examination was carried out on 500 pigs sampled from seven districts. The prevalence of cysticercosis ranged from 4% to 12.9%. Predisposing factors to porcine cysticercosis were found to be: open-air defecation, ignorance of the communities about the disease, free range scavenging pig husbandry methods and no inspection of pigs or pork destined for the local market. Porcine cysticercosis, therefore posed a major public health risk in this region in Uganda. It was therefore found necessary to educate local communities about the risks posed and the risk factors attributed to its high prevalence. Modes of disrupting the life cycle should therefore be designed.

Keywords: risk factors, prevalence, porcine cysticercosis, Lake Kyoga Basin

Introduction

Porcine cysticercosis is a disease caused by a tapeworm called *Taenia solium*. In its life cycle, human being is the final host where the adult tape worm is found in the intestines causing a disease condition called taeniosis. The human being gets the infection when he eats cysticercotic pork which is poorly cooked such that live larval forms of the parasite are in the pork. The larvae develop into the adult worm in the intestines of the human being producing eggs that pass out with the human faeces. The pig, which is the intermediate host, gets infected when it eats faeces of the human being that has the eggs of the taenia parasite which develop into the larval form in many parts of the pig causing porcine cysticercosis.

Cysticercotic pigs have been observed among the pigs offered for slaughter in many abattoirs in Uganda like in Wambizi abattoir (1, 2). Seroprevalence for cysticercosis in pigs in Kamuli district had been observed to be 8.6% (3). There was no information about the predisposing factors for the existence of the disease in these areas. Most of the studies were based on abattoir surveys. But it had been observed that traders screened the pigs in the

villages before purchasing and presenting them for slaughter at the abattoir. This meant that the disease prevalence observed in the abattoir could be lower than what was actually existing in the field. It was therefore imperative that proper field prevalence of cysticercosis be established. Also factors causing high prevalence of porcine cysticercosis in rural Uganda be established so that cost-effective preventive measures be designed and enforced. Elsewhere many factors had been found to be related to the existence of this disease (4, 5). Therefore this study was designed to establish the lingual prevalence and existence of the predisposing (risk) factors for porcine cysticercosis in the selected districts.

Materials and Methods

The study was carried out in seven purposively selected districts in Ugandan as shown in (Figure 1). These districts had the highest pig populations and they were the major suppliers of pigs for pork in the urban settings. (6) Amolator district had a pig population of 8,202 pigs, Kaberamaido had 9,860 pigs, Kamuli had 28,100 pigs, Kaliro had 8,000 pigs, Kayunga 10,916 pigs, Apac had 8000 pigs and Oyam had 4500 pigs. (6)

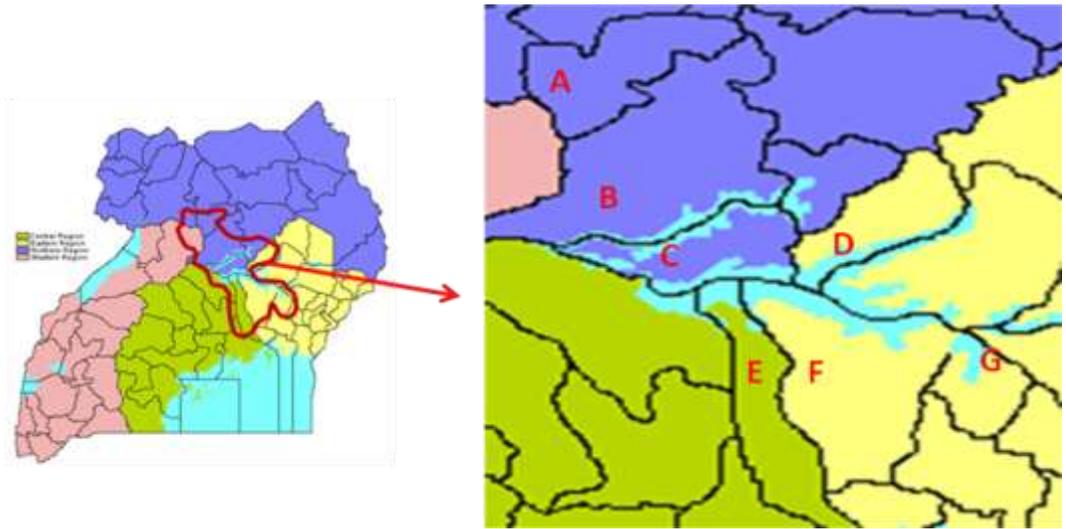


Figure 1: Map of Uganda showing the selected Study Sites/Districts where the survey for cysticercosis was carried out. (b) Inset showing the enlarged view of the study districts; A= Oyam, B= Apac, C= Amolator, D=Kaberamaido, E= Kayunga, F= Kamuli, G= Kaliro

A questionnaire containing both structured and semi-structured questions was used for data collection. Observation was also very important in verifying the answers received from the respondents especially in relation to the risk factors for the disease. A latrine, if present, was regarded as being used if any of the followings was observed: footmarks in the path towards the latrine, trails of urination at the latrine, no cobwebs in the door way and the latrine hole, footmarks around the latrine hole and smell of faeces.

All sub-counties in a district were given codes and the codes were written on different pieces of paper. Mixing of the papers was carried out and at random one paper was picked from the container and the sub-county on the paper was taken to be the study site in the district. Purposively a village where there were many pigs was taken as the starting point and a 10 km² area was covered in the particular study site.

Questionnaire administration was carried out after every four house-holds in each study village. Basing on the Keish and Leslie formulae for sample size (7), a minimum of 16 respondents were to be covered. But for high resolution of the work, the number was doubled to 32. The Local council chairman of the village and the local Veterinary staff acted as guides for the interviewers starting from an agreed starting point in each village. Thirty two respondents were

interviewed per study district and a total of 224 respondents were interviewed.. Data was entered and analyzed in Stata version 10.

For lingual examination of pigs, home-to-home-visit method was adopted (8) to access the pig farmers. Pigs were restrained by casting on lateral recumbence. Examination of tongue for cysts was achieved by using a smooth wooden rod put caudal to the canine teeth of the pig and a small shear movement was made to demobilize the jaws. Using a cotton towel, firm grip on the tip of the tong was achieved and the tongue pulled rostrally to expose the ventral surface. Palpation of the tongue for cysts was carried out. In every household, three pigs aging beyond 3 months were randomly examined.

Postmortem, being more sensitive than palpation, was carried out as a measure to cross-check the positivity of the lesions observed by lingual palpation (9). From every study site (village) two lingual positive pigs were bought from the farmers. Fourteen pigs were taken to the Faculty of Veterinary Medicine, Makerere University, Kampala, Uganda. The pigs were kept for three months and thorough systematic postmortem examination carried out. The examination was carried out by slicing of the muscles at 1 centimeter interval (9). A carcass was taken as positive if a cyst was found.

Results

The lingual prevalence of cysticercosis per district were summarized in Table 1 below. Kamuli had highly significant prevalence of cysticercosis than any other district ($P < 0.01$). All the pigs were observed to be cysticercotic but six out of 14 pigs (42.86%) had massive infection with more than 10 cysts per 10 cm^2 . Lesions were found in different organs as shown in Plate 1.

The status and type of latrine coverage in the study area were as shown in Figure 2. On community commitment to latrine usage; only 62.5% of the respondents deposit human faeces in the latrines, 34.4% carry out intermittent use of latrines and 3.3% have never deposited faeces in latrines despite presence of latrines. Evidence of usage of latrine from observational point view were 63.2% only and 36.8% of the latrines had no sign that they had been used of recent.

Pig husbandry practices according to season were as shown in Figure 3. Communities' perceptions about the transmission of *Taenia solium* (taeniosis) in people were as summarized in Figure 4. Eighty four percent of the households do not know the mode of transmission of taeniosis to people. Communities perception of transmission of cysticercosis to pigs were as shown in Figure 5. Eighty seven point five percent of the respondents do not know how the pig gets the infection. The decision taken by the community on the pigs diagnosed to be infected by cysticercosis were as shown in Figure 6. Only 47% of the respondents did not sell the pigs diagnosed infected with cysticercosis. Forty three percent of the respondents sold off the infected pigs, possibly to buyers who were not aware of the pig's health status. Regularity of inspection of pork consumed by communities were as shown in Figure 7.

Table 1. Lingual prevalence of cysticercosis per district

District	Prevalence
Oyam	9.4
Apac	7.7
Amolotar	8.2
Kabermaido	6.9
Kayunga	0
Kamuli	12.9
Kaliro	4.1

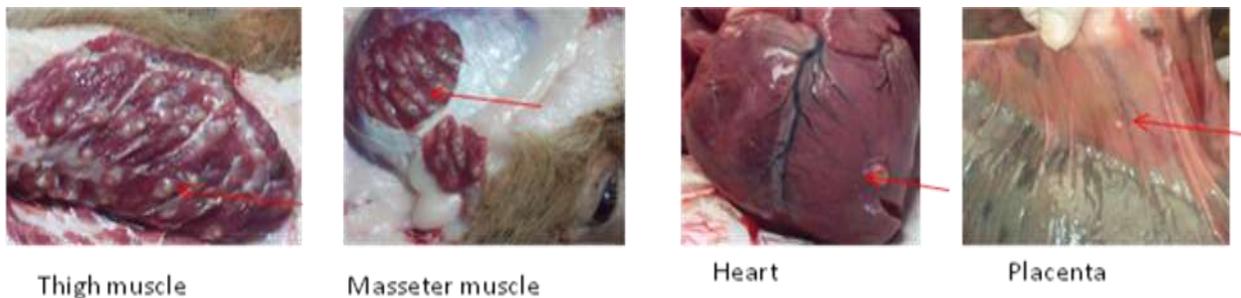


Plate 1: *Taenia solium* cysts in different organs in the porcine

Figure 2. Status of latrine coverage and types of latrine structures

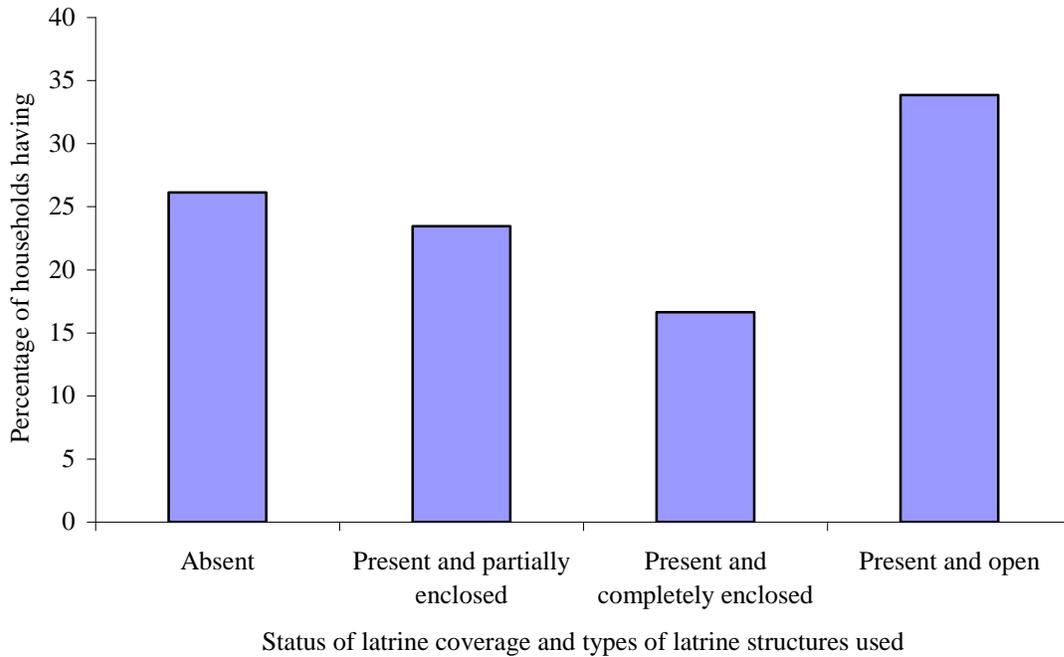


Figure 3. Pig husbandry practises relative to the crop season

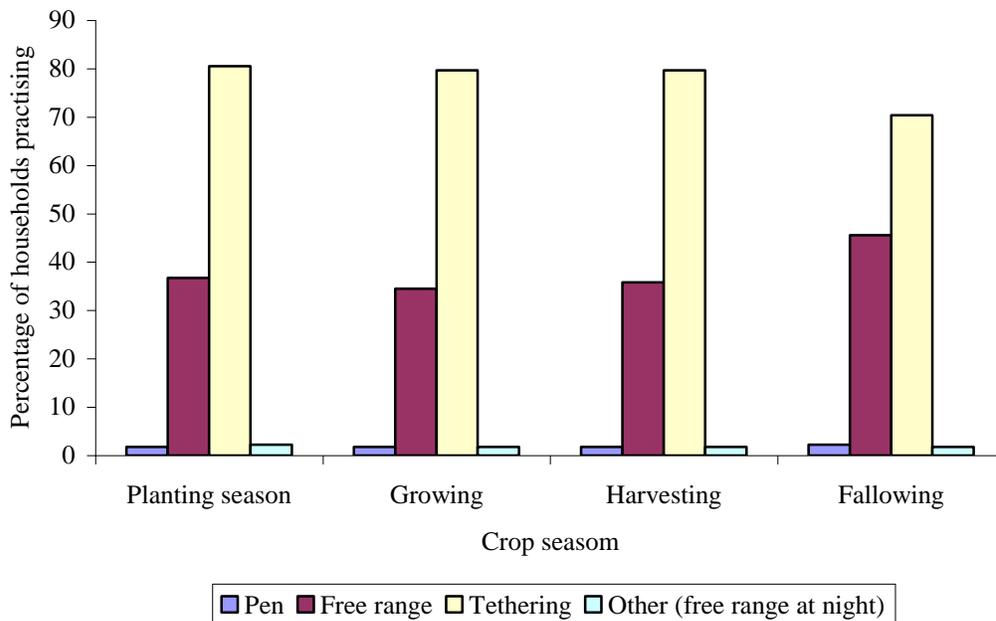


Figure 4. Community perceptions about transmission *Taenia solium* to humans

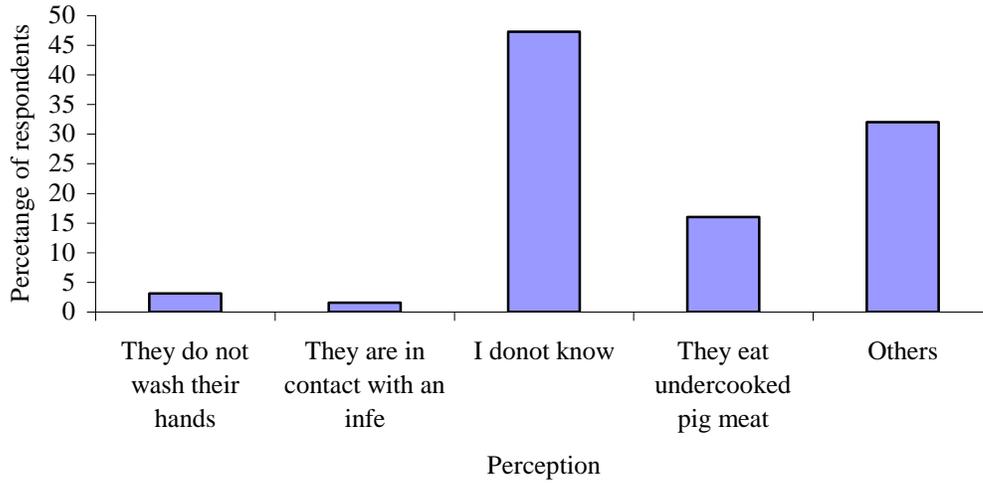


Figure 6. Community perceptions on the transmission cystercercosis to pigs

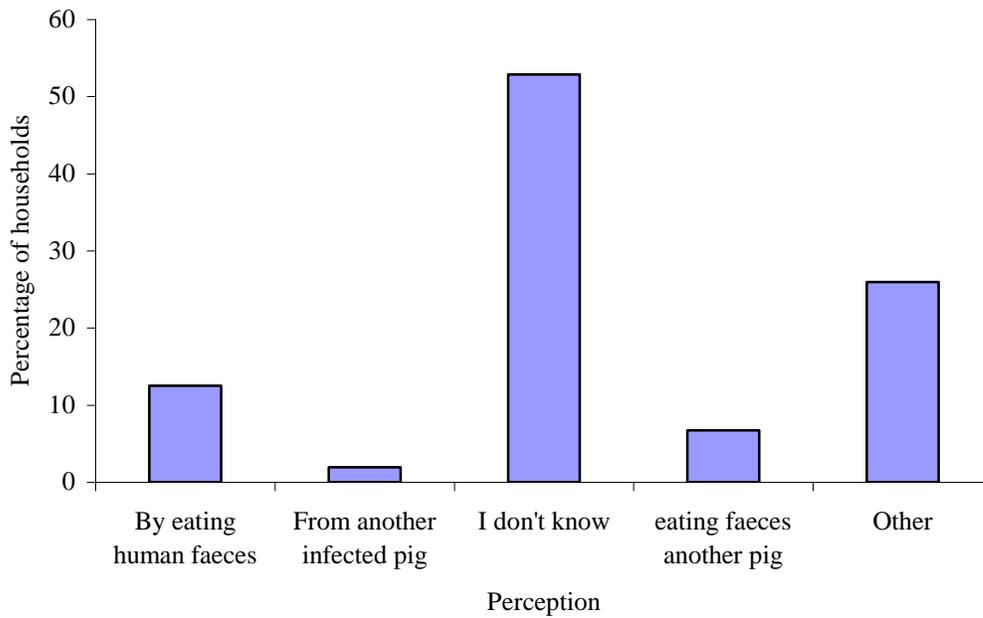


Figure 7. Fate of pigs diagnosed to be infected with cyticercosis as practised by the communities

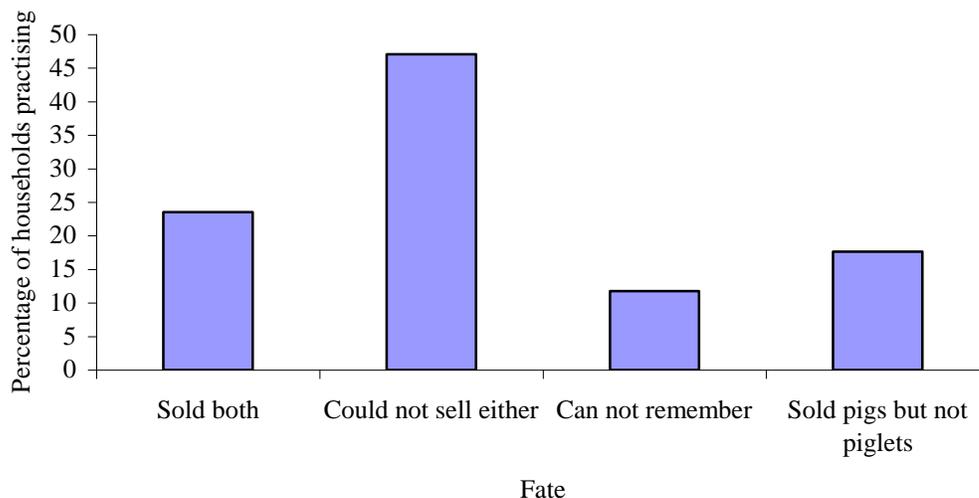
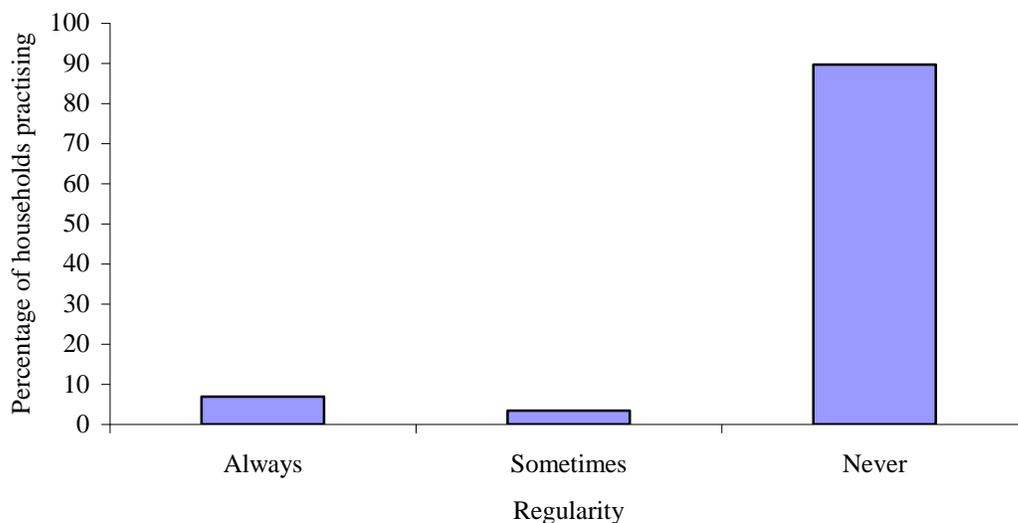


Figure 8. Regularilty of pork inspection by the communities



Discussion

Although earlier abattoir studies and incidental findings had indicated that porcine cysticercosis exists in some parts of Uganda (1, 2), this is the first field based study to cover many districts to evaluate the prevalence and pre-disposing (risk) factors related to its existence. It was found that that porcine cysticercosis was wide spread in districts around

Lake Kyoga. It was only in Kayunga district where no lingual prevalence was realized. This was attributed to the outbreak of African swine fever that had just killed a lot of pigs before the survey was carried out. Most of the pigs examined could have been brought from other places as an attempt to restock. The lingual prevalence of cyticercosis found (4.1%-12.9%) fall within range reported from other areas. Prevalence of 7.7% had been reported in

endemic villages of Zambia (9) and 13.3% in endemic villages in Peru (11).. these findings therefore suggest that porcine cysticercosis was endemic in districts around Lake Kyoga.

From the status of latrine coverage and usage (Figure 2) it can be deduced that most of the households (59.9%) carry out open air defecation. This practice could be playing a big role in increasing of porcine cysticercosis. Elsewhere it has been observed that there is a positive correlation between reduction in latrine coverage with increase porcine cysticercosis (5, 10). Open air defecation allows roaming pigs to access to human faeces with tapeworm eggs. This could be a major risk factor making cysticercosis to be endemic Lake Kyoga basin.

Another risk increasing transmission of porcine cysticercosis is ability of pigs wander freely (4, 5, 10). In this study we found out that it is only 1.8 % of households where the pigs were kept in total enclosed pens. About 30% of the households keep the pigs at free range through out the year. Tethering in the bushes around the homes was a common practice (Figure 3) where a pig could access infected open-air defecated human faeces. The pig husbandry practices carried out in Lake Kyoga basin could be another factor bringing about endemicity of cysticercosis in the area.

It was found that the communities knew about porcine cysticercosis but did not know prevention and control (Figures 4 and 5). This has been found to be true in Mbulu District, Tanzania (12). In our study, a few of the respondents either knew that the human being gets infected by eating undercooked cysticercotic pork (16%) or pigs get the infection from eating human faeces having eggs of the tapeworm (12.5%). The proportion of the communities around Lake Kyoga basin did not have a right knowledge about the transmission of the parasite to human and the pigs thus becoming a big risk factor contributing for occurrence of the disease in the area.

Usually consumption of safe pork is promoted by adequate inspection of the pork to detect *Taenia solium* cysts. Ninety percent (Figure 7) the respondents do not have their pork inspected by meat health inspectors.. There was a lot of backyard slaughter at none gazetted places. Elsewhere, backyard pig slaughters have been found to be a source of unsafe pork to consumers Mbulu in

Tanzania (5). This factor is further compounded by the fact in this area even those pigs which were diagnosed through lingual inspection to be infected were sold to unsuspecting consumers (Figure 6). These observations could explain endemic status of porcine cysticercosis in the Lake Kyoga region.

It became apparent from this study that education of the communities about the risks and the risk factors for prevalence of porcine cysticercosis be carried out. Modes of interrupting the life cycle of *Taenia solium* so that we can reduce chances of infection by *Taenia solium* to the people and the pigs in this area need to be adopted. The control methods need to be introduced and scaled out by public health workers and local government.

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