**Katie Holmes**
**Internship Report**
**Organization: International Livestock Research Institute**
**Project: Safe Food, Fair Food**
**Supervisor: Dr. Kristina Rösel**
**Location: Kampala, Uganda**
**Dates: 23 July 2012 to 22 August 2012**

**Introduction**
As a veterinary medical student, I have acquired a particular interest in the epidemiology of infectious diseases of animals and the impact of those diseases on human populations. This interest, combined with my attraction to issues concerning international health, compelled me to seek a field experience with the International Livestock Research Institute (ILRI). Conducting projects in many countries throughout the world, the mission of ILRI is to produce high quality, scientifically based research within the livestock sectors of developing nations in order to direct the implementation of evidence-based policies for capacity building and poverty reduction for small-holder livestock producers (CGIAR, 2011).

Safe Food, Fair Food (SFFF) is an ILRI project that is performing research in multiple countries in sub-Saharan Africa and within specified livestock value chains in those countries. In this region, only a small percentage of animal products are distributed to consumers through formal markets, with the majority going through informal markets. These informally marketed animal products are not subjected to proper safety inspection, putting consumers at risk for a variety of food-borne microbes and parasites which can cause gastrointestinal infections, and more rarely, brucellosis, tuberculosis, listeriosis, toxoplasmosis and cysticercosis, to name a few (Makita et al., 2011; Phiri et al., 2003; Waiswa et al., 2009). These infections negatively impact the human population, including higher infant mortality rates and contributions to poverty by decreasing animal productivity (Grace et al., 2012). However, high quality animal protein is an important dietary nutrient, especially for children. Additionally, the production, transportation, processing and retailing of animal products provide employment for millions of people in these countries. The goal of SFFF is to improve market access for poor small-holder livestock producers while also improving food safety for poor consumers in these countries. Improvements in food safety will be made using risk-based approaches, as opposed to older, often ineffective methods that rely on the banning of products that are perceived to be hazardous.

In Uganda, SFFF focuses on the pig sector. The pig sector in Uganda is rapidly expanding, with the population of pigs increasing from 0.19 million to 2.3 million in the past three decades (FAOSTAT, 2010; UBOS, 2008). Following the end of the reign of Idi Amin in Uganda, pig keeping became an increasingly popular strategy for earning extra income. It is also a popular food, being favoured as a highly palatable meat among Ugandans, many of whom consume pork in local establishments known as “pork joints.” In the 1960s, pork accounted for only 1-2% of the per capita meat consumption among Ugandans; it now accounts for at least one third of per capita meat consumption (FAOSTAT, 2010). Between
1980 and 1990, the annual growth rate of the pig population in Uganda was estimated to be 20% (FAO, 2005). In terms of total annual tonnage of meat produced, pork ranks second only to beef in Uganda, and because there is little movement of meat products across borders in this region, this ranking is indicative of the relative importance of pork for meat consumption among Ugandans (FAOSTAT, 2010).

Currently there is little information available describing the structure of the pig market in Uganda. A livestock census conducted in 2008 by the Uganda Bureau of Statistics reported that approximately 1.1 million households keep pigs, with an average of two pigs being kept by each household. This means that roughly 17% of all households in Uganda keep pigs and that the majority of pigs are kept in small-holder systems as opposed to intensive farming situations (UBOS, 2008). Most households keep pigs tethered or allow them to wander, with little or no housing (Waiswa, 2005). Because pigs are omnivorous and can eat a wide range of items, they can either be let loose to scavenge or be provided with bran or food scraps. Pigs are usually not slaughtered for household consumption; they are instead sold at times of economic hardship, such as at the beginning of the school term in order to pay school fees (Ampaire & Rothschild, 2010). A significant advantage of the pig for poor households lies in the fact that they require little economic investment in terms of feed or housing but provide a significant payment when they are sold. Intensification of pork production in Uganda is limited by the disorganized nature of informal markets, which are the primary venue for the sale of pork products, as well as disease risk, especially African Swine Fever (ASF) (Costard et al., 2009). Pigs serve no other cultural or livelihood roles in Uganda besides being a productive asset that can be sold when needed.

Safe Food, Fair Food’s goal in Uganda is to assess the pig value chain using risk-based approaches to identify points in the “farm to fork” pathway at which controls for safety may be implemented effectively and economically. This method is meant to improve the safety of the animal products bought by poor consumers while maintaining or improving the profit margins of the poor families producing those animal products. In order to achieve these outcomes, SFFF develops and tests pragmatic whole-value-chain applications of risk-based approaches for the enhancement of food safety in Uganda’s pig sector, as well as other livestock sectors in other countries, including Tanzania, Mali and Ethiopia. The assessment in Uganda has three primary components which will be explored over the next three years:

- Rapid assessment of food safety in selected value chains.
- Action research on priority food safety issues in these chains.
- Engagement with regional economic communities, value chain stakeholders, academia and the private sector.

A rapid risk assessment is taking place during the first year of the project. In this initial assessment, three types of pork value chains will be considered: rural production for rural consumption; rural production for urban consumption; and peri-urban production for urban consumption. During my one-month internship, I was responsible for assisting with the initial assessment of peri-urban pork production for urban consumption. My tasks, as outlined at the beginning of my internship, were:
• To assist in capturing mapping and observation data at the sole pig abattoir in Kampala.
• To assist in enumerating informal slaughter slabs, pork joints, consumers, etc. during the rapid appraisal in urban and peri-urban Kampala.
• To find literature regarding prevalence data of swine diseases of economic and zoonotic importance in Uganda.

Activities
The SFFF project with which I was involved while in Uganda was a multi-hazard risk assessment that relied on Participatory Epidemiology (PE) techniques and observation of behaviour to identify which potential hazards were most likely present. This work was performed in Kampala, Uganda at the Wambizzi Cooperative Society Limited, the only registered pig abattoir in Kampala. The assessment was meant to identify risk factors that may cause disease in humans, both occupational and food-borne, and to ascertain the disease signs present in live and slaughtered pigs as perceived by the workers at the abattoir. Abattoir workers, inspectors and management were interviewed regarding their knowledge and attitudes concerning the activities at the abattoir, as well as the seasonality and regional distribution of suppliers of animals to the abattoir.

Participatory Epidemiology (PE) is a relatively new branch of veterinary epidemiology that focuses on animal health. It is similar in nature to Participatory Rural Appraisal (PRA) in that it incorporates the knowledge and opinions of stakeholders in problems relating to veterinary public health (Catley, 1997). It is a cost-effective and quick method for identifying risks to public health in animal product markets. We utilized PE methods in our assessment of the activities and facilities of the cooperative, including informal interviews, visualization methods and ranking and scoring methods. These methods were used with three groups of key informants: the abattoir management (4 people), the meat inspectors (2 people), and a group of 10 abattoir workers. By interviewing people from three different positions, we were able to examine the problems at the abattoir from three different perspectives.

We applied several PE tools to this study, including:
• Mapping of the premises by abattoir management.
• Temporal mapping of the seasonal supply of pigs by month throughout one year.
• Geographical mapping of supply from the districts of Uganda.
• Mapping of the slaughter process at the abattoir by the enumerators.
• Mapping of the animal products and cash flow.
• Proportional piling to identify proportions of live and slaughtered pigs with various disease signs.
• Structured interviews with the meat inspectors to assess knowledge, attitudes and methods of inspection.

The slaughter process mapping and the structured interviews with the meat inspectors were two activities which I found to be especially informative and memorable. For our interviews with the two meat inspectors, Dr. Rösel and I each followed one of the
inspectors, asking questions of them as we observed their inspections. We questioned them regarding various aspects of their job performance and working environment, as well as the relative frequencies with which they observe diseases in the pigs that come to the slaughterhouse. We discussed their education, compensation, equipment, health statuses and inspection procedure, as well as their attitudes toward their work. While talking with them, we also made notes on our own observations of their activities during the meat inspections. The slaughter process mapping involved the recording of the slaughter for one pig from the beginning with the live pig to the end with the distribution of the various products and by-products. A live pig in the holding pens was selected and then followed from the holding pens throughout the whole slaughter process, with notes being made regarding handling of the live pig and the carcass.

Results and Conclusions

Using methods of Participatory Epidemiology, we were able to gather valuable information on several aspects of the pig value chain in Uganda. Approximately 57% of the pigs slaughtered at this abattoir come from suppliers in central Uganda, with 21%, 15% and 7% coming from the eastern, northern and western regions, respectively. This data will be important for value chain mapping and for determining the geographic distribution of diseases in later studies. In addition to the suppliers of the pork throughout the country, we asked the abattoir management to generically identify their primary purchasers of pork products. They listed, in order of amount purchased, pubs/pork joints, processors, butchers, supermarkets, hotels and private organizations/individuals. This information will be useful in future studies to elucidate the impact of relevant diseases on consumers.

The management were helpful in identifying factors that affected the supply of pork to the abattoir, and these factors, which directly impact the pork value chain and the profits of its various players, included holidays, the start of school terms, diseases (especially African Swine Fever), weather changes and even the release of the national budget.

In order to identify potential hazards and risks and to direct the planning of future biological sampling, we engaged in a mapping of the abattoir premises, as well as a mapping of the slaughter and inspection of a single pig. We identified several possible major risk factors in the facilities. The placement of the various buildings was not practical for the hygienic movement of animal carcasses. There were no proper latrines for the workers at the abattoir, and no restrictions were placed on the people who were allowed onto the premises. Additionally, solid waste materials were dumped in a pile and periodically burned behind the slaughter house, while liquid wastes, including blood and feces, were allowed to run off into the shallow, sometimes stagnant, streams that ran around the perimeter of the property. There was no electricity in any of the buildings, and as slaughtering began before sunrise, the meat inspectors had to use flashlights in order to check the carcasses. Dr. Rösel and I each chose a pig to follow through the whole slaughter process, from cutting and bleeding to sale of the individual parts. Briefly, pigs were selected and directed to the slaughter house, where their throats were cut (without prior stunning). They were bled lying laterally on the floor of the slaughter building, and after several minutes, they were placed into a tank of boiling water. From here, they were dragged on the ground to the evisceration building to be de-haired and eviscerated. After removal of the internal organs, they were inspected and stamped. From here, the carcasses
were moved to another building to be weighed, and then the different organs were sold on the premises. The inspection was cursory at best, with no ante mortem examination preceding slaughter. Internal organs were only inspected if requested by the slaughter house workers; the meat to be sold was inspected, primarily for *Taenia solium* cysts. After an in-depth interview with the inspectors, we learned that they receive little support, in terms of equipment and continuing education, from their employers, the Kampala City Council. The inspectors also do not have access to further diagnostic testing for cases involving diseased animals.

While conducting a PE session with the slaughter house workers, we asked them to identify potential disease signs that they see in the animals that they slaughter. These signs, as well as frequency as perceived by the men slaughtering the pigs, are listed in the following table. These disease signs can correspond with a variety of diseases that could potentially be present in the population of pigs entering the abattoir and being distributed to consumers.

<table>
<thead>
<tr>
<th>Signs seen in live pigs</th>
<th>Often</th>
<th>Less Often</th>
<th>Rarely</th>
</tr>
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<tbody>
<tr>
<td>Diarrhea</td>
<td>Nasal discharge only</td>
<td>Coughing</td>
<td></td>
</tr>
<tr>
<td>Bruising/lesions on back</td>
<td>Ectoparasites (lice)</td>
<td>Hernia</td>
<td></td>
</tr>
<tr>
<td>Combination of red ear tips, bleeding patches, nasal discharge and diarrhea</td>
<td></td>
<td>Vomiting</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Circular scabs</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Signs seen in slaughtered carcasses</th>
<th>Often</th>
<th>Less Often</th>
<th>Rarely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bleeding tendency</td>
<td>Intestinal worms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White lesions in liver</td>
<td>Scabies</td>
<td></td>
<td></td>
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<tr>
<td>Reddened skin</td>
<td>Lung nodules</td>
<td></td>
<td></td>
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<tr>
<td>Skin lesions</td>
<td>Cyanotic ears</td>
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<td></td>
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<tr>
<td>Cysts in muscles and organs</td>
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<td></td>
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<tr>
<td>Swollen limbs</td>
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Because this was a preliminary study taking place before biological sampling, we were not yet able to present quantitative data on diseases present in the pigs coming into Wambizzi. Some activities that represented possible risk factors for both zoonotic and inter-animal disease transmission included the absence of a structured ante mortem examination, the lack of separation of clean and dirty areas, the lack of a comprehensive inspection and the inaccessibility of further diagnostic testing for suspect disease cases. We did attempt to make some recommendations for the improvement of the facility based on our observations of the slaughter process and our understanding of the financial and managerial structure of the abattoir. We suggested more extensive training for everyone employed at the abattoir, from the men actually slaughtering the pigs to the meat inspectors to the management. We also discussed the possibility of moving the entire facility to another location with a more appropriate design for the layout of the buildings and the movement of carcasses through the slaughter process. We felt this would allow for a lesser potential for contamination of the meat products.
Future directions for the SFFF project in Uganda include biological sampling to determine what diseases are present at each stage of the pig value chain and with what prevalence they are present. With this data, methods for improving food hygiene for Ugandan consumers and mitigating the occupational risks to the slaughter house workers will be established. While working in the ILRI office, I had the opportunity to search for available literature regarding statistics of swine diseases of economic and public health significance in Uganda. Interestingly, I found very little prevalence data regarding important diseases of swine in Uganda or more generally in East Africa. In assessing the available literature, I learned that there is a great deal of potential research to be done in livestock and public health related fields in Uganda. To extrapolate, this is likely true for much of sub-Saharan Africa, and while there is certainly much work to be done, I am excited for the possibility of contributing to that effort.

References

Catley, A. Adapting Participatory Appraisal (PA) for the Veterinary Epidemiologist; PA tools for use in livestock disease data collection. (1997) Society for Veterinary Epidemiology and Preventative Medicine Proceedings. 2010; Chester, UK.


