



Combating Kwashiorkor: Replenishing the Tryptophan in Sanambele, Mali



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Introduction

- Kwashiorkor is a problem in many material resource-poor countries where foods containing “complete proteins” are scarce.
- Coined as “what happens to the baby when a new baby comes” in the 1930s, kwashiorkor affects young children most when weaned off mothers breast milk.
- Kwashiorkor is a form of malnutrition where child receives adequate caloric intake but amino acids are not present in correct ratios to build needed proteins for normal physical and mental development.
- Building block model shows how missing one essential amino acids can be detrimental to normal protein construction:



- In Sanambele, village children traditionally consume grasshoppers from the field to supply tryptophan and other amino acids to their bodies
- New farming techniques in the areas, especially insecticide sprays, have diminished the grasshopper population, and reduced tryptophan supply in village children’s diet
- Most recent date indicated are few cases of kwashiorkor in Sanambele but 23% of the children are at risk

Hypothesis Tested :

A plant source of tryptophan can be found that the farmers can grow to supplement their diets and alleviate kwashiorkor in Sanambele



Fig 1. Women and men Farmers and their families in Sanambele discussing two of their main cash crops, cowpeas (left) and shea butter (right).

The Site: Sanambele, Mali

- Area of recurrent droughts
- 3-4 months of rainy season June through September
- 45 inches of annual precipitation
- Temps range from 60° F to 102° F (16° C to 39° C)
- May is the driest month but there is NO rain October through May
- The soil is clayey with moderate productivity (British Foreign Commonwealth Agency 2008)



Fig 2 Images of Sanambele



Fig 3. is the dry bed of the Zangolo River a channel of the Niger River. The Zangolo here is running along the edge of the village garden area.



Fig 4. Satellite image of Mali

The women and men of the village are the primary farmers. They harvest millet, sorghum, corn, dry upland rice, cow peas, peanuts and a myriad of garden vegetables, as well as shea nuts, cashew, and limes. While the women work in the fields the children look after the younger kids (Dancing Across the Gap, Dr. Dunkel. 2006)



Fig 5. A wild bush called sinjian in Bambara.



Fig 6. Lettuce going to the weekly market. It is keeping a big ball of Shea butter cool, that is a product made by this farmer from wild collected shea nuts.



Fig 7. Children of the village of Sanambele

Recommendations

Dates (*Phoenix dactylifera*): a palm cultivated for the sweet fruits

- Native to The Fertile Crescent and Egypt
 - Thrive in dry arid conditions
 - Fruits have most protein after being dried, which is a simple procedure
 - Very similar to the dried tomatoes
 - Date Palms can take up to 10 years to produce fruit but with provide over 250 lbs of dates each year
 - Grow to about 20 meters
 - The soil in Sanambele may not support the large tap root for the tree
- Contains 33g protein and 0.57g tryptophan for every 100g**



Fig 8. Date palm

Sesame (*Sesamum indicum*): A flowering plant that produces pods of small seeds

- Native to Sub-Saharan Africa but very adaptable, grown as a cash crop in other parts of Mali at least 1998-2002
 - Cultivated in India, China and The Middle East
 - Easy to cultivate and dry
 - Also easily added to any dish
 - Only grows to about 2 ft tall and produces the pods that contain the seeds in the first year
- Contains 17g protein and 0.37g tryptophan for every 100g**



Fig 9. Sesame flower

Chick Peas (*Vigna unguiculata*): In the legume family

- Originated in Turkey, but very adaptable
 - One of the oldest cultivated plants
 - Grows about 2 ft tall and produces pods that have 2-3 peas in them
 - Thrives in heat
 - The peas can be eaten raw or cooked and can also be ground into a flour
- Contains 17g protein and 0.30g tryptophan for every 100g**
(USDA Indexes 2009)D



Fig 10. Chick pea plant

Conclusion

When introducing a new crop to a village it is vital to keep the holistic goals in mind. Sanambelean farmers came to us because they were worried about their children’s diets and asked if there was anything we could do to help. Now that we have come up with ideas on how we can help, we can share these ideas with village elders and present them, with all benefits and downfalls considered to the elders to make the final choice, to help them with the Decision we have to explain how mothers breast milk Contains all the necessary amino acids for development and a child can eat one of these plants to continue to get that nutrient in their diet .

