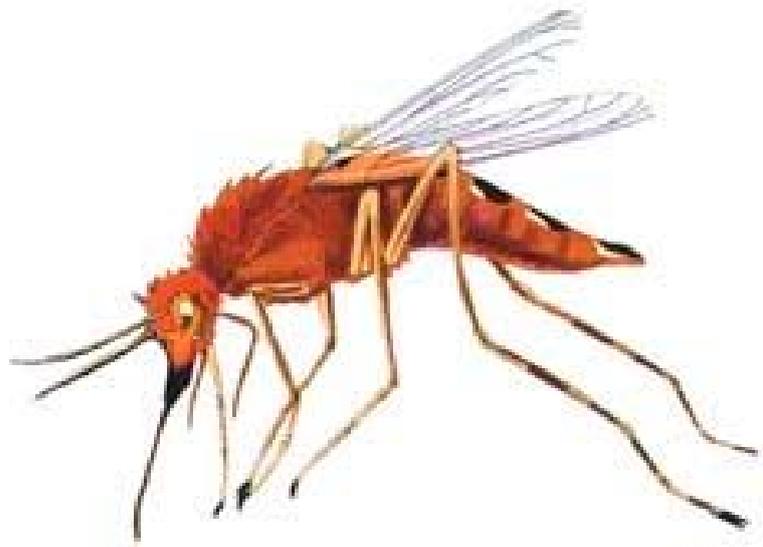


# SOUTHERN SUDAN MEDICAL BULLETIN

February 2008  
Vol 1, Issue 1



Anopheline mosquito – prolific transmitter of falciparum malaria

Pass this Bulletin to Healthcare Professionals in the Hospital near you in Southern Sudan.

Published by Healthcare Association of Southern Sudan (HASS)

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To inform, educate and positively influence the  
development of Health Services in the Southern Sudan

*Manuscripts typed by Mrs Madeleine Linington, Medical Secretary*

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## **Editorial**

The Southern Sudan Medical Bulletin (SSMB) was founded to fill in a void in medical, nursing, pharmacy, laboratory and therapy information to Southern Sudanese Healthcare professionals on the state of health in Southern Sudan. It is also aimed at identifying issues that may be addressed to improve health provision in the Southern Sudan. SSMB is a multidisciplinary publication available free online and to a limited number of colleagues working in rural areas of the Southern Sudan without Internet connection as print copies.

Whilst the Government of Southern Sudan grapples with the issues of developing the infrastructure of health services in the Southern Sudan, it is my sincere hope that this publication will provide Healthcare Professionals with evidence-based information on the management of the common illnesses which continue to afflict the people of the Southern Sudan. During the twenty-three year old war (1982 – 2005) it has been observed that the incidence and prevalence of the traditional tropical diseases (*schistosomiasis, leishmaniasis, malaria, guinea worm infestation, trachoma, trypanosomiasis, leprosy, onchocerciasis and tuberculosis*) has increased in the Southern Sudan compared to the neighbouring countries where these have either been largely contained or eliminated. This publication will report on the incidence and prevalence of these conditions and hopefully attract research interest and funding to contain them. The prevalence of the human immunodeficiency virus (HIV) and the acquired immunodeficiency disease syndrome (AIDS) has not been determined clearly in the Southern Sudan. During the war many populations were shielded from each other by pockets of armed engagement between the Sudan People's Liberation Army and the Soldiers of the Sudan Government and as such one can assume that the transmission of the HIV/AIDS was low. However with the advent of peace in the Southern Sudan since the signing of the Comprehensive Peace Agreement on the 9 January 2005, free movement between the East African countries of Uganda, Kenya, Tanzania and the Democratic Republic of the Congo might have changed the epidemiology of HIV/AIDS. SSMB hopes to publish any sero epidemiological studies on the prevalence of HIV in the Southern Sudan so that preventive measures may be instituted very soon.

As in any post conflict situation, young men in their prime who have worked as Soldiers emerge from the war with disabilities such as limb amputations, impaired vision or hearing and the sequelae of traumatic brain injury. Some continue to be troubled by post traumatic stress syndrome and issues of body image due to missing limbs. Though none of these conditions have known cures, the offer of organised rehabilitation by trained Specialists in this field will ensure the appropriate prescription of limb prosthesis (artificial limbs), psychological interventions for those suffering from head injuries, the provision of wheelchairs and vocational rehabilitation to ensure that disabled persons find gainful employment. Research into the level of disability in the Southern Sudan needs to be carried out to ensure that help is targeted at those affected. Training of Healthcare Professionals will be determined by the level of need resulting from any cross-sectional studies to determine the prevalence of disability in the Southern Sudan community. Organisations specialising in Rehabilitation may wish to undertake projects of this nature once they understand the scale of the problem.

Maternal and infant mortality continue to cause concern in Southern Sudan. The figures are high according to current estimates but a systematic collation of data by county or payam (a payam is a collection of 3 – 5 villages) needs to be carried out urgently in order to inform preventive measures.

SSMB will carry Continuing Professional Development (CPD) pages to offer ongoing updates in various ways of prevention and treatment of common conditions. This will ensure that colleagues working in the rural areas without access to current journals, either in print form or via the Internet update their knowledge and skills through articles aimed at honing basic clinical skills. Hence, SSMB will publish case histories, summaries of published Articles in peer reviewed journals which bear relevance to health in a tropical environment, informative clinical photographic materials, quizzes with answers and review articles on a range of subjects such as clinical therapeutics, patho-physiology of disease, complications, treatment and research methodology.

Articles will be welcome from all Healthcare Professionals working in the Southern Sudan or those working abroad who wish to know more about the health circumstances in the Southern Sudan.

I am responsible for the selection of the current editorial board simply because I have been in correspondence with almost all those who are on the Board. This is a provisional Editorial Board whose composition will change as the Bulletin evolves. The aim is to have twelve to fifteen members of the Editorial Board from both the Southern Sudan and the Diaspora. There are currently six unfilled vacancies which should be filled by three Healthcare Professionals from each of Baher-El-Ghazel and Upper Nile regions. We need some female professionals on board and hope that some of the six will be women professionals from medicine, nursing, pharmacy or laboratory technology.

The survival of the Journal will depend on contribution of articles from all those with interest in Health in the Southern Sudan. Please print off paper copies and disseminate them to Healthcare workers in the Southern Sudan.

Eluzai A Hakim  
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## **Information to Authors**

The Southern Sudan Medical Bulletin (SSMB) is a quarterly peer-reviewed publication intended for the consumption of Healthcare Professionals working in the Southern Sudan or those Healthcare Professionals in other parts of the world seeking information on health in the Southern Sudan. It will be published in mid-February, May, August and November of each year.

The publication will be **free online** and viewed via the Health Association of Southern Sudan (HASS) website and the St.Mary's Hospital, Isle of Wight(United Kingdom)-Juba Teaching Hospital Link ("www. low.nhs.uk/juba). After accessing the relevant website click on the link for the SSMB. The Bulletin aims to offer education and information to Healthcare Professionals in all Specialties and identify research which will inform development of Health Services in the Southern Sudan.

**The content of the Bulletin** will consist of reports of original research, critical/systematic reviews, case reports, clinical photographic materials, obituaries, letters to the Editor, use of drugs, medical news of public interest, nutrition matters, public health issues and history of health services in the Southern Sudan.

Articles submitted to SSMB must not be submitted simultaneously to other publications and should not have been accepted for publication elsewhere. All articles will be reviewed by two independent reviewers (peer-reviewed).

All authors must declare any conflict of interest as will members of the Editorial Board.

Articles of any author(s) suspected of medical or other misconduct will not be published. Depending on the seriousness of the matter, the authors will be reported to the appropriate Regulatory Bodies wherever they live.

## **Referencing articles**

SSMB has adopted the Vancouver style in which references are cited in numerical order as below. For economy of space journal names may be written in full or abbreviated, viz :

### **Article**

- i) Majok MN, *New Treatment for Trypanosomiasis*. BMJ 2008; 400 : 10 – 15.

### **Book**

- ii) Lado CS, Woro ME. *Health Development in Southern Sudan*. Juba University Press: 2010.

**Chapter**

- iii) Gbuduwe C, Lumayat A, editors. *The Nodding Disease*, 10<sup>th</sup> Edition. Nairobi : East African Publishing House 1998.

References should accompany a statement quoted as superscript, for example, reduced efficacy demonstrated<sup>2</sup>.

Capitalise Book titles :

Page numbers should be written as 10 – 19 (meaning from 10 to 19).

Journal Titles may be abbreviated for example BMJ (for British Medical Journal).

Reports should be written beginning with the origin of the Report followed by the title, the Publisher, the year and possibly include the website, for example, Department of Health. *National Service Framework for Coronary Disease*. London : DOH (Department of Health 2000 ([www.doh.gov.uk/nsf/coronary.htm](http://www.doh.gov.uk/nsf/coronary.htm)) from BMJ guideline for authors).

**Mother and child undernutrition – Vitamin A deficiency**  
**Ann Burgess MPH (Nutrition Consultant)**

Undernutrition among mothers and children is the underlying cause of a third of all child deaths and more than 10% of the total global disease burden <sup>1</sup>. The situation is probably worse in Southern Sudan where rates of undernutrition are high <sup>2</sup>. The immediate causes of undernutrition are a nutrient-deficient diet and frequent infections. Here we describe vitamin A deficiency, future articles will cover other types of malnutrition.

**Vitamin A deficiency disorders**

Worldwide vitamin A deficiency (VAD) <sup>a</sup>:

- Affects about 25% of young children with equatorial Africa (and probably Southern Sudan) having some of the highest rates <sup>1</sup>.
- Causes about 6% of young child deaths <sup>1</sup>.
- Affects at least 6% of pregnant women <sup>3</sup>.

<sup>a</sup> Footnote. Vitamin A deficiency is defined as 'liver stores of vitamin A of less than 20mcg /g' <sup>4</sup>.

Groups at risk of VAD are those who have:

- Diets lack vitamin A especially they are also low in fat – see Box 1.
- Frequent infections - especially diarrhoea, measles, respiratory diseases, intestinal parasites and HIV. These infections reduce appetite, damage the gut and/or increase needs.
- High needs (for their size) for vitamin A (e.g. young children and pregnant/lactating women <sup>5b</sup>)

Hence VAD is seen most often among young children, pregnant and lactating women, those with HIV, and, sometimes, people in emergency situations.

<sup>b</sup>Footnote. The units of retinol activity equivalents/day needed by: men are 600 mcg, young children 400 mcg, pregnant/breastfeeding women 800-850 mcg <sup>5</sup>.

VAD results in reduced immunity (so increased mortality from infections), anaemia (due to impaired transport of iron), poor growth and, in severe cases, xerophthalmia and blindness - see Box 2.

---

**Box 1. About vitamin A**

Vitamin A occurs mainly as 'retinol' in animal foods and as 'β-carotene' in plant foods <sup>c</sup>. The bio-availability of carotene is about 1/12 that of retinol but is improved if the food is cooked and the meal contains fat.

Good sources include:

- As retinol: liver from animals and fish, kidney, breastmilk and colostrum, milk fat/butter, whole dried fish, egg yolk.
- As β-carotene: pumpkins and other orange fleshed vegetables (but not tomatoes), paw paws, mangoes, yellow bananas (if eaten in large amounts) and dark/medium green leaves.

<sup>c</sup> Footnote. Vitamin A is measured in 'micrograms retinol activity equivalents' (mcg RAE). Approximately 2 mcg β-carotene in oil and 12 mcg β-carotene in mixed food converts in the body to 1 mcg RAE. Vitamin A in pharmaceutical supplements may be measured in International units (IU). 1 IU = 0.3 mcg RAE.

---

## Diagnosing VAD

Box 2 describes how to diagnose xerophthalmia. There are no simple tests for moderate VAD but in Southern Sudan VAD is likely to affect all at-risk groups especially at times when, or in places where, VAD-rich foods are scarce, or infection and malnutrition rates high.

VAD is termed a significant health problem if:

- At least 5% of women had night blindness during their previous live-birth pregnancy *and/or*
- The under five year old death rate is >50 per 1 000 live births <sup>4</sup>.

## Controlling VAD

Ways to control VAD include:

1. Encouraging the consumption of more vitamin A-rich foods (including breastmilk and colostrum). So discuss with community groups:
  - Why vitamin A-rich foods are important especially for women and young children.
  - Which local foods are rich in vitamin A, and are good value for money or easy to produce.
  - Practical ways to produce, preserve and cook these foods.
2. Giving vitamin A supplements.
3. Preventing infections. For example, by breastfeeding, immunisations, impregnated bednets and deworming.

### *Vitamin A supplements*

Vitamin A supplements are usually given orally as high dose capsules. Table 1 shows a schedule to prevent vitamin A deficiency. *Never* normally give a high dose to a woman who might be pregnant because it can harm her foetus. It *is* safe for pregnant women to take low dose supplements and to eat plenty of vitamin A foods.

If a child has:

- Prolonged or severe diarrhoea, acute respiratory infection, chicken pox, severe malnutrition and other severe infections, give one high dose as in Table 1 (unless the child has had a dose within the previous month). If the child is under 6 months give a single dose of 50,000 IU (one white capsule).
- Measles but no eye signs give a second dose the following day.
- Any signs of xerophthalmia and/or severe malnutrition give another dose after 2 weeks (see Box 2).

When giving high dose capsules:

- Explain why they are needed and that they are safe.
- Cut the capsule near its base of the nipple and squeeze the contents into the mouth.

Side effects (e.g. bulging fontanel or vomiting) are rare, and not serious or long lasting.

**Table 1. Vitamin A supplements to prevent vitamin A deficiency**

Group	Dose	Type of capsule supplied by UNICEF
Infants 6 to 11 months	100,000 IU Every 4-6 months	Three drops from red capsule or One blue capsule
Children 12 to 59 months	200,000 IU Every 4-6 months	One red capsule or Two blue capsules
Post partum women	200,000 IU single dose <i>within 8 weeks of delivery</i>	One red capsule or Two blue capsules

Based on data in reference 6.

**Box 2. Xerophthalmia**

The term 'xerophthalmia' describes all the eye signs of VAD – see Table 2.

**Table 2. Signs of xerophthalmia**

Sign	Description
Night blindness	Inability to see in dim light (e.g. at dawn or dusk). Often occurs in the later part of pregnancy.
Conjunctival xerosis	The conjunctiva looks dry and slightly rough instead of smooth and shiny.
Bitot's spots	White foamy patches on the conjunctiva. Not always present.
<i>Active corneal lesions: At this stage the condition can worsen within a few hours and complete or partial blindness can result.</i>	
Corneal xerosis	The cornea looks dry and cloudy.
Ulcers on the cornea	Often on the edge of the cornea.
Keratomalacia	The cornea is cloudy and soft like jelly. Rare.

To diagnose:

- Ask about night blindness. This is a useful sign especially if there is a local word for it.
- Examine each eye *very gently* for the signs in Table 2.

To treat:

- If there are *any* signs of xerophthalmia give high dose vitamin A as in Table 3.
- Active corneal lesions are a *medical emergency* so *immediately* start the treatment schedule in Table 3 - even for pregnant women. If you have no high-dose capsules give any other vitamin A supplement and refer.
- If the eyes have ulcers or look soft or cloudy<sup>7</sup>:
  - put 1 drop of 0.1% atropine into the affected eye to relax it and prevent the lens pushing out. Do this 3 times/day for 3-5 days.
  - instil chloramphenicol or tetracycline eye drops (as required 2-3 hourly for 7-10 days). Never use ointment containing steroids.

- put 0.9% saline soaked pads on the affected eye(s) and bandage.
- if necessary bandage the hands to prevent a child touching the eyes.

**Table 3. Treatment schedule for those with xerophthamia or severe acute malnutrition<sup>6</sup>**

	Vitamin A IU		
	Immediately*	Next day (day 2)	Day 14
Children:			
- Under 6 months	50,000	50,000	50,000
- 6-11 months	100,000	100,000	100,000
- 12 months and over	200,000	200,000	200,000
All adults except reproductive-age women**	200,000	200,000	200,000
Reproductive-age women	10,000 daily or 25,000 weekly for at least 4 weeks		

See Table 1 for colour of capsule to use.

\* Unless received a dose in the previous month.

\*\* Do give high doses to reproductive-age women *if there are corneal lesions*. Then the risk of blindness outweighs the risk of damage to the foetus if she is pregnant.

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Useful websites on VAD: Helen Keller International [www.hki.org](http://www.hki.org); Micronutrient Initiative [www.micronutrient.org](http://www.micronutrient.org); Micronutrient Forum <http://www.micronutrientforum.org>; SIGHT AND LIFE [www.sightandlife.org](http://www.sightandlife.org).

I declare I have no conflict of interest.

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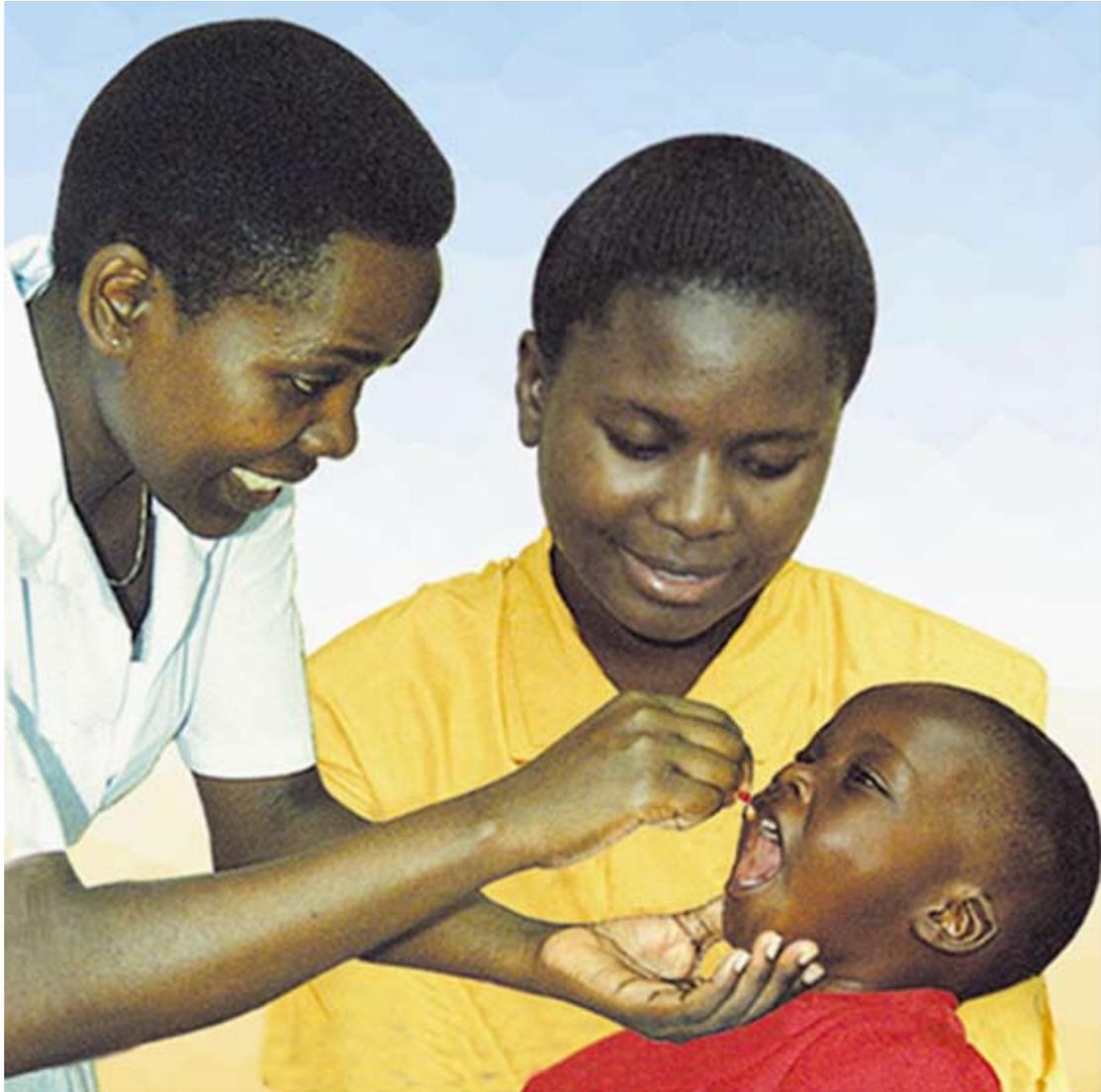
Thanks to:

- Paluku Bakwere, Cicely Clarke, Nicky Dent, Philippe Donnen and Bertha Jackson for contacts and comments.

- SIGHT AND LIFE ([www.sightandlife.org](http://www.sightandlife.org)) for permission to use their photographs.

Captions for photographs:

1. "Giving a high dose vitamin A capsule (from SIGHT AND LIFE)"
2. "Child with severe xerophthalmia (from SIGHT AND LIFE)"





## Review

### Oncocerciasis

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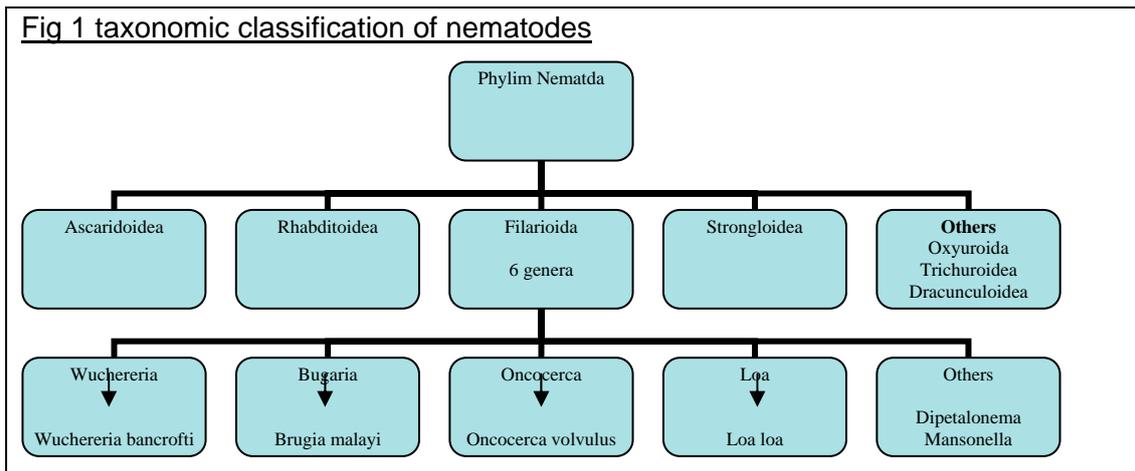
#### **Abstract**

Oncocerciasis is a parasitic disease that primarily affects economically disadvantaged communities in Africa and Latin America. It results from infection with filarial nematode *Oncocerca volvulus*, transmitted to man through the bite of infected black fly of *genus simulium*. It is the second commonest infectious cause of blindness responsible for an estimated 340,000 cases of blindness and one million cases of visual impairment. The disease is endemic in 30 countries in Africa, six countries in Latin American and in Yemen. More than 85% of the world population is at risk of infection while 18 million are already suffering from the disease. Infection intensity and ocular morbidity including blindness is highest along fast flowing rivers where the vector breeds. Oncocercal blindness has serious social and economic impact. It strikes mainly at economically active adults at the prime of their life thereby leading to reduction in productivity, death and abandonment of fertile agricultural lands. The systemic and ocular manifestations of Oncocerciasis are discussed in this review in order to bring awareness of the importance of this disease in the epidemiology of blindness and visual impairment in South Sudan where it is endemic

#### **Introduction**

Nematodes are unsegmented round worms. They have an elongated cylindrical bodies covered by tough cuticle and a cavity in which the organs lie. Phylum **Nematoda** includes a great number of species some of which are free living and others parasitic. There are seven super families, four of which are of clinical importance to man [fig 1].

Fig 1 taxonomic classification of nematodes



The super family Filarioidea is composed of parasites of subcutaneous or connective tissue, lymphatic system or serous cavities. These worms do not lay eggs but give birth to larvae. In order to complete their development the larvae require a second host (vector) in which development has to occur to produce infective form. Man cannot therefore acquire the parasite directly from an infected person. Transmission has to be through the bite of an infected black fly in which the larvae has to developed. The four species of medical importance, their main vector and distribution are shown in [fig 2]

Fig 2 Species of filarial nematodes of medical importance

Species	Adult worm	Microfilariae	Vector	Distribution
Wuchereria bancrofti	Lymphatic	Blood	Culex species	Tropics
Brugia malayi	Lymphatic	Blood	Mansonia	South East Asia, India Sri Lanka
Loa loa	Subcutaneous	Bood	Chrysops species	West/Central Africa
Oncocerca Volvulus	Subcutaneous	Skin/eyes	Simulium	Africa/South America

### Oncocerca volvulus

Oncocerca volvulus is almost exclusively a parasite of man. The adult worm lives encysted in fibrous subcutaneous nodules (fig 3) although some nodules may be so deeply situated as to be impalpable <sup>1</sup>. Each nodule contains 1-2 males and 2-3 female worms lying in a twisted tangled mass. The male worms are shorter (3.5cm) while the females are much longer (50-70cm). Female adult worms can live for up to

9-10 years and can produce close to 1600 microfilariae/day, resulting in total microfilaria load of 150 million or more<sup>2</sup>.

Fig 3 *Oncocerca* nodule containing mass of worms



Tangled worms in a nodule whose wall has been digested. Note the twisted mass of male and female worms

### **Parasite life cycle**

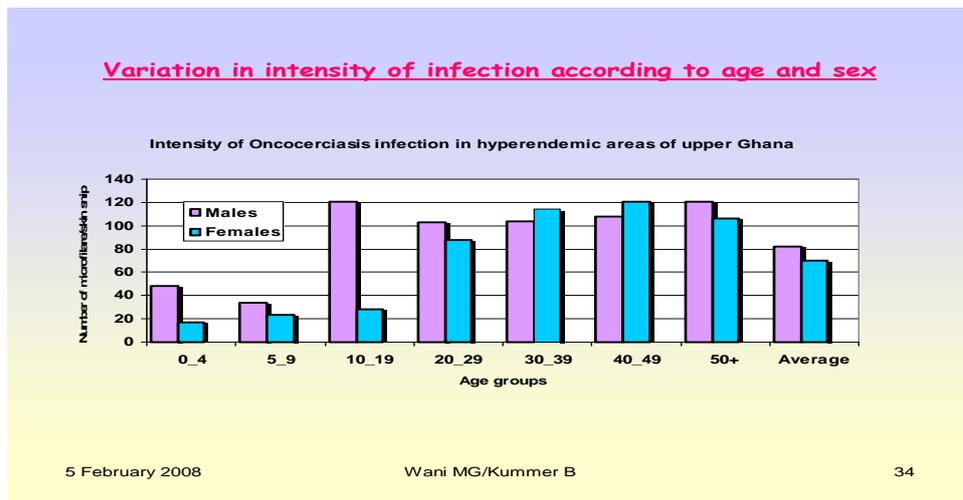
Microfilaria released by the female worm migrates to skin and subcutaneous tissue where they are picked up by the vector during a blood meal. In the vector they develop after 3 moults into third stage infective larvae ready to be transmitted during the next blood meal and thereby completing their life cycle. After entering the new host, the infective form moults twice to become immature adults. These become encysted in fibrous nodules where the male fertilizes the female which then begin producing millions of microfilariae

### **The Vector**

The main African vector of *Oncocerca volvulus* is *Simulium Damnosum*. It is made of several cytospecies. These dominate different environments and many do not feed on man and therefore do not transmit disease. The other important vector is *S neavei* which occurs mainly in East Africa. The larvae are always attached to bodies of crabs in contrast to *s damnosum* whose larvae live on rocks and vegetations. One other African species, *S Albivirgulatum* is found in the Republic of Congo

*Simulium* bites by day and can make long wind assisted flights covering several kilometers. Exposure to the bite of *simulium* depends on several factors including distance of the dwellings from the breeding site of the fly, the age and sex of the victim, occupation and habits of the individual. Boys are exposed to transmission 2

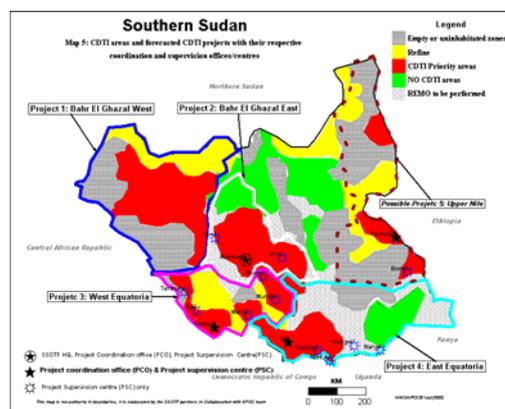
times more than girls while there is no sex difference in the exposure of men and women [fig 4]. Occupation is another factor that may expose a person to intense transmission and high risk of blindness. Fishing or farming activities associated with the river as well as Ferry men and those who have to dig sand along river banks have high chance of transmission. Levels of transmission among expatriate workers living in Tent hotels along the Nile is not currently known



### Epidemiology of Onchocerciasis in South Sudan

Nearly all parts of south Sudan have onchocerciasis of varying intensity. High prevalence can be found along the Nile basin and its distributaries. The Bhar El Gazel States, Western and Eastern Equatoria States and some areas of Jongole State have high prevalence. These areas are currently targeted by the onchocerciasis control program (fig 4)

**Map of S. Sudan showing CDTI priority areas [red] where there is high prevalence of onchocerciasis.**



## Clinical Features of Oncocerciasis

There is a wide spectrum of clinical manifestations and marked geographic variation in clinical picture which may be related to pathogen city of *Oncocerca volvulus*, vector biting habits and host immune response. Signs and symptoms of oncocerciasis can be classified into Dermal, lymphatic, ocular and systemic.

### **Dermal oncocerciasis**

Pruritis is the most common early manifestation of oncocerciasis. It may affect upto 30% of the population in hyperendemic areas. Itching can be so intense as to render the patient sleepless, fatigued and depressed. Many patients suffer from low self esteem and may be socially ostracized as a result of social stigma. Patients may scratch the skin with objects such as sticks and stones leading excoriation and secondary infection. The first visible signs in the skin other than evidence of scratching are an alteration in pigmentation with areas of hyper or hypo pigmentation. After years of chronic infection atrophy of skin develops leading to an appearance called *Lizard skin*. This is characterized by thin epidermis with shiny fragile surface. The normal dermal structure is replaced by thin un-elastic scar tissue. Another characteristic aspect of oncocercal skin disease is leopard skin, a spotty depigmentation occurring in the anterior aspects of lower extremities. In Africa oncodermatitis is typically generalized, diffuse and maximal on the lower trunk, pelvic girdle, and thighs [fig 5]

Fig 5 Dermal changes in Oncocerciasis



Leopard Skin  
**Skin nodules**



Lizard skin

Adult worms of *oncocerca volvulus* are found encapsulated in skin nodules which are usually subcutaneous but may also be found in deep layers, near to joint capsules, bones and fasciae and therefore often impalpable. A nodule contains on average 1-2 males and 2-3 females. A typical onco-sarcomata is easy to recognize and differentiate from *Lipoma*, *lymph node*, *Dermoid cyst*, *Ganglia* or *histoplasmosis*. They appear as firm round elongated non tender subcutaneous tumor. The size may vary from half a centimeter to 10 cm. Nodules are usually freely mobile but may be fixed to fascia or skin. Distribution of nodules may vary according to regions which may relate to frequency of bites to different parts of the body in different regions and availability of clothing to cover the body. In Africa for instance, people rarely cover their trunks or wear huts hence high frequency of bites occur on the trunk, buttocks, pelvis and legs where most nodules are found [fig 6]. In Central America nodules are found mainly on neck and head and in lower parts of the body in Yemen. Presence of nodules on or near the head has importance significance for ocular involvement and blindness rates. Microscopically a nodule has an outer scar tissue enclosing the adult worms. Soft tissue composed of granuloma, fibrin, macrophages and ploymorphonuclear neutrophils may surround the worms in some nodules where portions of the worm may lie free.

**Skin nodules on trunk, pelvis and abdomen in scantily dressed African female**

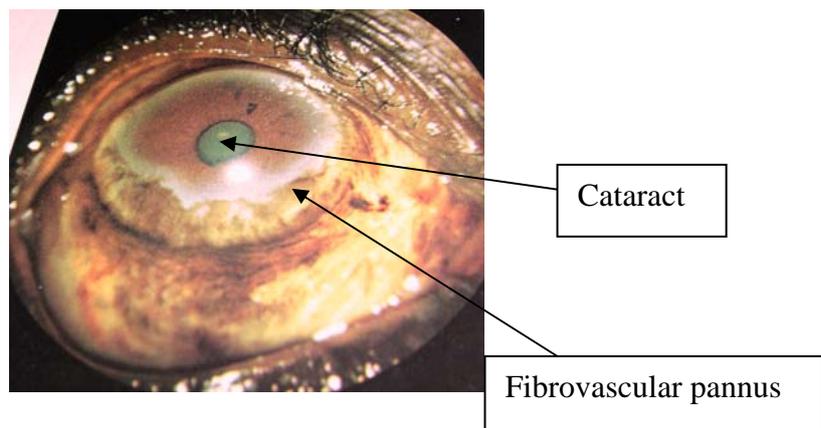


## Ocular manifestations

Ocular manifestations due to oncocerciasis may involve any part of the eye from conjunctiva and cornea to uvea and posterior segment including retina and optic nerve. The first sign of ocular involvement is the inversion of the anterior segment where microfilariae can be seen swimming freely in the anterior chamber. Conjunctiva reaction with inflammation and chemosis can be seen. The cornea is involved in punctate Keratitis which appear as snowflake opacities of 0.5mm in diameter representing dead microfilaria surrounded by inflammatory infiltrate.

In later stages *Sclerosing Keratitis* may develop usually as a result of large number of microfilariae in the cornea. This is a fibrovascular tissue growing initially in the inter palpebral fissure and inferiorly and progressing to reach central cornea, causing blindness. Anterior Uveitis can lead to posterior synechie especially occurring at 6 o'clock position causing the characteristic pear shaped pupil also called *Onco pupil*. Uveitis may cause cataract and glaucoma which can contribute to visual loss in oncocerciasis [fig 7]

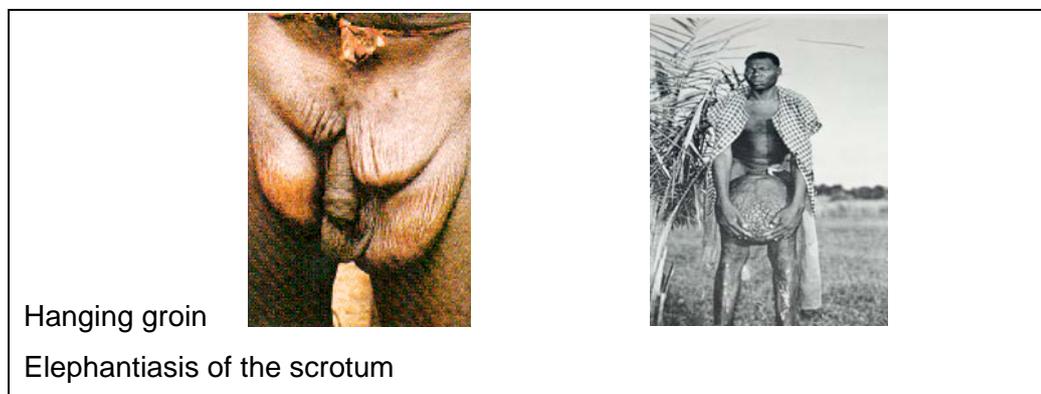
A wide spectrum of retinal changes may exist. In the early stages of retinal involvement *cotton wool spots* (soft exudates) may be observed. In advanced cases chorioretinal atrophy may occur associated with retinal pigment clumping. Optic atrophy is usually associated with peripheral visual field loss, key hole vision and total loss of sight. Blindness results from sclerosing Keratitis, iridocyclitis, chorioretinitis or optic atrophy



## Lymphatic Oncocerciasis

In heavy microfilarial infestation some of the parasites pass to lymph nodes draining areas of oncocercal dermatitis. Any superficial nodes including cervical, axillary, epitrochlear, inguinal and femoral may be involved. These nodes contain varying number of microfilariae most frequently in the capsule and subcapsular sinusoids. Enlargement of inguinal nodes in combination with wrinkled skin, may give rise to hanging groin. Elephantiasis of the scrotum may also occur<sup>3</sup>

**Fig 8: Hanging groin and elephantiasis of the scrotum in lymphatic Oncocerciasis**



## Systemic Oncocerciasis

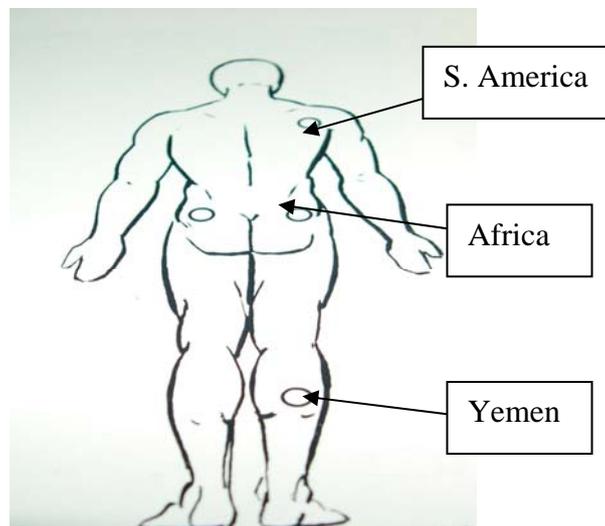
Oncocerciasis can be considered a systemic disease. Small number of microfilariae can be found not only in skin, eyes and lymph nodes, but also in deeper organs including liver, kidney, spleen, pancreas, lung, peripheral nerves and arteries. Body fluids like blood urine, tears CSF and peritoneal fluid as well as vaginal fluid may contain microfilariae. In hyper-endemic areas patients with heavy parasite load may lose weight and suffer from lethargy. Systemic effects of oncocerciasis may lessen productivity and increase mortality

## Diagnosis

### **Skin snips**

The best method for parasitological diagnosis of oncocerciasis is the skin snip. The snip should be taken from sites where maximum yield is expected as shown in the picture. The main areas in Africa include the iliac crest. Skin snips can be taken with a razor blade or with forceps or curved scissors. After taking the snip is transferred immediately to a drop of normal saline or distilled water on a microscope slide and examined with x10 objective. The number emerging from the snip is counted in 30 minutes. Afterwards the snip is allowed to dry and fixed and stained for identification of infective species in areas where *D. Streptocerca* is suspected

### **Sites where skin snip biopsy will yield maximum number of microfilariae in different regions**



### **Mazzotti Test**

In 1948 mazzotti described an allergic reaction following the administration of 50 mg of Diethyl Carbamazine (DEC). Reaction usually starts 15-30 minutes after taking the tablets although it may be delayed for 24 hours. Itching is usually the first symptom of this reaction followed by erythema and papular eruption. Papules are usually discrete but may coalesce to form generalized brawny induration. Severe reactions can cause fever, pulmonary oedema or even shock. DEC also causes migration of *O. Volvulus*

into the cornea, urine and sputum of patients who react with respiratory distress and productive cough. Because of these severe reactions Mazzotti test is not recommended as a routine diagnostic test.

### **Treatment of Oncocerciasis**

Oncocerciasis is the second commonest cause of infectious blindness and causes immense suffering and debility from non ocular symptoms like itching and skin changes. Treatment of oncocerciasis has immense social and economic benefit for the individual and community at large. Reduction in microfilarial load can limit ocular manifestation of disease there by preventing loss of sight, limit transmission and reduce disabling symptoms of itching and excoriation of skin.

The two drugs for treating oncocerciasis (Diethylcarbamazepine DEC and Suramin sodium) have largely been abandoned to due to presence of serious and long lasting side effects. DEC does not kill the adult worm so that the skin is usually repopulated by new microfilariae 6-12 months after treatment. Optic neuritis, chorioretinitis and proteinuria do occur and can be very severe

New drugs have now been synthesized and old compounds are been re-examined in an effort to find improved chemotherapeutic regimens that are safe and affordable.

Ivermectin, a macrocyclic lactone produced by the *Actinomycete streptomyces avermitilis* is a broad spectrum anti-parasitic, displaying efficacy against Nematodes and arthropods. It was first used in veterinary medicine until 1982 when the first application in humans was reported. Since then subsequent studies have determined its efficacy and safety. Ivermectin was shown to improve both eye and skin lesions and the number of microfilariae in the anterior chamber reduced considerably.

A single dose of 150µg/kg (0.15-0.2mg/kg) body weight given every 6 months suppresses microfilarial load as shown by marked decrease in skin snip counts. Incidence of side effect which are related to death of microfilariae also decreased with subsequent treatment. Dosing schedule is shown in the table. Dosage is determined by height and/or weight. Children under the age of two years, weighing less than 15kg or height less than 90cm, pregnant or women in the first two weeks of lactation as well as those who are very ill should be excluded. Mass distribution of Ivermectin is the only way to ensure reduction in transmission by keeping the

parasite load low in those who are infected. This can be carried out once every 6 months in highly endemic communities

<b>Drug</b>	<b>Height (cm)</b>	<b>Weight (kg)</b>	<b>Dose (tablets)</b>	<b>Duration</b>	<b>Comment</b>
Ivermectin 6mg	90 - 119	15 - 20	1/2	Once	Repeat after six months
	120 - 140	21 - 44	1		
	141 - 158	45 - 64	1 <sup>1/2</sup>		
	159+	65 - 84	2		

Ivermectin is considered a safe drug although some side effects requiring treatment have been reported. Approximately 10% of patients will develop severe side effects which include intense itching, skin oedema, arthralgia and bone pain, severe headache and fever. These side effects can be treated with antihistamines and Acetylsalicylic acid

### **Concomitant infection with intestinal parasites**

Oncocerciasis patients living in hyper- endemic areas are often co-infected with intestinal parasites. In one study done in Sierra Leone West Africa<sup>4</sup>, more than 88% of patients were found to be co infected with *Trichuris Trichura*, *Ascaris Lumbricoides*, *schistosoma mansoni* and *hookworm*. 64% were found to have protozoan cysts in their stools, most of which were *Entamoeba coli*. Treatment with ivermectin was found to reduce significantly egg counts of

*Ascaris lumbricoides*, No effect on hookworm eggs has been demonstrated so far. Treatment of oncocerciasis with ivermectin may therefore have a positive effect on other intestinal nematodes and may even clear cysts of *entamoeba coli*

### **Nodulectomy**

Excision of *Oncocerca* nodules (nodulectomy) is one of the earliest methods of treating oncocerciasis. Nodulectomy does not reduce microfilarial skin counts possibly because some nodules are so deeply located that they may not be palpable. Excisions of nodules close to head may help protect the eye from heavy infestation with micorfilariae and may thus delay or even prevent blindness.

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## Public Health and Health Policy in South Sudan

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### Introduction

This article aimed to highlight the important of public health, and focus on legislative framework on water and sanitation as an approach to addressing some of the health challenges.

This section of South Sudan Medical Bulletin is dedicated for articles on public health and health policy in South Sudan. As this is the only medical journal the South has ever launched, its vision should be holistic of improving health of the people of South Sudan and should include public health and health policy. It should inform the Ministry of Health, as the custodian of health of the people of South Sudan, in developing health policies.

As the custodian of the nation health, the Ministry of Health, Government of South Sudan (GOSS) should address public health challenges. Its current mission<sup>i</sup> of focussing on healthcare delivery (The Mission of the MOH-GOSS is commitment to ensure equitable sector-wide, accelerated and expanded quality health care for all people in Southern Sudan, especially women and children) , while it is welcomed, remains limited as this does not address other areas of public health domain (see below).

Table 1: The three domains of public health<sup>ii</sup>

Health Protection	Health and Social Care Quality	Health Improvement
<ul style="list-style-type: none"> <li>• Clean air, water, and food</li> <li>• Infectious diseases</li> <li>• Emergency response</li> <li>• Radiation</li> <li>• Chemicals and poisons</li> <li>• Environmental health hazards</li> <li>• Prevent war and social disorder</li> </ul>	<ul style="list-style-type: none"> <li>• Service planning</li> <li>• Clinical effectiveness</li> <li>• Clinical Governance</li> <li>• Efficiency</li> <li>• Research, audit and evaluation.</li> </ul>	<ul style="list-style-type: none"> <li>• Improving health</li> <li>• Reducing Inequalities</li> <li>• Employment</li> <li>• Housing</li> <li>• Family/community</li> <li>• Education</li> <li>• Lifestyles</li> </ul>
<p>Surveillance and monitoring of health and determinants of health underpins all three.</p>		

This article is structured to cover the following areas:

- Public health: definition; and vision for health in South Sudan
- Water and Sanitation: proposals for a legislative framework

### **Public health: definition, and vision for health in South Sudan**

Public health is defined as:

*"The science and art of preventing disease, prolonging life and promoting health through organised efforts of society."<sup>iii</sup>*

Therefore, public health approach is population based; emphasises collective responsibility for health, its protection and disease prevention; recognises the key role of the state, linked to a concern for the underlying socio-economic and wider determinants of health, as well as disease; and emphasises partnerships with all those who contribute to the health of the population.<sup>iv</sup> It is an approach by which we can achieve health, as defined by the World Health Organisation (WHO) – "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."<sup>v</sup>

In 2006, the Health Association of South Sudan developed a vision of health for South Sudan. This vision offers significant input upon which to build on (Box below). It envisages **"A Healthier Nation, Reduced Health Inequalities, and Better Quality of Life."** **A country where<sup>vi</sup> ...**

- There is access to safe drinking water, adequate sanitation system, education, housing, and security for all the citizens;
- The people take responsibility for their own health and are engaged with healthcare service;
- There is reduced incidence of communicable diseases;
- There is a reduced maternal mortality rate; reduced mortality rate of under fives, comprehensive coverage of all children under 5 years by the immunisation programmes, reduced malnutrition rates, and increased life expectancy;
- There is clean environment, and adequate food supply;
- There is reduced corruption.
- There are healthy cities, towns and villages.

The importance of the above vision is that it enables the Ministry of Health and its partners to direct its resources towards activities aimed at realising the vision, which are most likely to yield maximum population health benefits. These activities include the following areas: sanitation; waste disposal; water; food safety; cigarette smoking; alcohol; housing standards; effective clinical service; professional regulatory bodies / framework to ensure quality in clinical services, etc.

Some positive initiatives in the right direction have been started by the Ministry of Health, GOSS, when it hosted the First South Sudan Health Assembly in Juba, in June 2007. Among other areas, the Assembly adopted resolutions to address issues on water and sanitation, including formulating legislative framework. The Assembly resolved that the Ministry of Health shall:<sup>vii</sup>

- identify and set up appropriate leadership at all levels;
- provide appropriate training for human resources;
- provide support to urban water firms, rural water (protected wells) and the establishment of reference laboratories in townships, for monitoring water quality;
- establish an inter-ministerial committee on water and sanitation; setting up a parliamentary committee on water and sanitation; and health education promotion;
- establish a legislative framework (public health laws) for regulating issues related to water and sanitation.

### **Water and Sanitation: proposals for a legislative framework**

In an effort to support the Ministry of Health in formulating legislative framework for South Sudan, the author, on behalf of Health Association of South Sudan, undertook a literature review on water and sanitation legislation from around the world to inform the above proposal.

Public Health Law has been defined as:

“The legal powers and duties of the state, in collaboration with its partners (e.g. healthcare, business, the community, the media, and academia), to assure the conditions for people to be healthy (e.g. to identify, prevent, and ameliorate risks to health in the population) and the limitations on the power of the state to constrain the autonomy, privacy, liberty, proprietary, or other

legally protected interests of individuals for the common good. The prime objective of public health law is to pursue the highest possible level of physical and mental health in the population, consistent with the value of social justice".<sup>viii</sup>

#### International experience

Various countries around the world have legislative frameworks governing access to their citizens of water and ensuring its safety from pollution. Examples of some of these countries include:<sup>ix</sup>

- South Africa: [National Water Act \(No. 36 of 1998\)](#).
- Uganda: Water Statute, 1995; [Water \(Waste Discharge\) Regulation No. 32 of 1998](#) ;
- United States: Clean Water Act of 1977.
- Bukina Faso: a wide range of regulations and laws covering its sanitation policy.
- Ghana: a country whose sanitation experience is similar to that of South Sudan, has a strategy with legislative recommendations to meet desirable water and sanitation goals for 2020. Among some of the main outputs expects are:
  - National Environmental Sanitation Day;
  - The national Environmental Sanitation Policy Co-ordination Council;
  - Environmental sanitation technologies are under regular review and continuous improvement;
  - All solid wastes generated in urban areas are regularly collected and disposed of in adequately controlled landfills or by other environmentally acceptable means;
  - All pan latrines are to be phased out (by 2010);
  - At least 90% of the population has access to an acceptable domestic toilet ,and the remaining 10% has access to hygienic public toilets;

## **Recommendations on Public Health (Water & Sanitation) Act for South Sudan:**

Based on international experience, the following proposal for legislative framework on water and sanitation are made for South Sudan.

### **GOSS Level**

Establishment of Public Health (Water and Sanitation) Acts (2008) for South Sudan, which shall contain the following:

- 1) Establishment of a body (e.g. Commission) whose responsibility it is to manage water and environmental sanitation. The body shall have legal powers to appoint appropriate Advisory Bodies e.g. Water & Sanitation Pollution Advisory Board; or National Study Board – responsible for investigation, and study of all technology, social and economic aspects of achieving required standards.
- 2) Establishment of conditions enabling the private sector to provide and charge fees for environmental sanitation services;
- 3) Establishment of incentives and of regulation, licensing and monitoring arrangements for water and sanitation;
- 4) Control and ownership of wastes;
- 5) Arrangements for budgeting and financing environmental sanitation services in the States Assemblies;
- 6) Any other legislation required establishing and maintaining acceptable standards of environmental sanitation.

### **GOSS/States Levels**

The South Sudan / State Legislative Assemblies shall promulgate legislation on water & sanitation addressing:

#### **I) General (Water & Sanitation) Measures**

Laws and regulations to enforce:

- a. The measures to take by administrative authorities for preventing or reducing communicable diseases.
- b. The measures to take for assuring the protection of food commodities on sale.

- c. The measures to take for assuring the disinfections or destruction of objects having served with diseases or have been contaminated by them and generally any object served by a contagious vehicle.
- d. The relative prescription for the complete deterioration of the quality of life, due to factors of pollution from air or water, industrial wastes, noise, effects of secondary pesticides, rat poisons, stagnation of water or bad conditions of conservation.
- e. The first line of enforcement shall be the Health Inspectorate (or Environmental Health Officers), working by a combination of education and persuasion. The objective should be to make the community understand and accept its responsibilities with regard to environmental sanitation.
- f. Establishment of zones for the provision of environmental sanitation services;
- g. Enforcement of public participation in critical environmental sanitation services;
- h. Designation of areas and facilities for the disposal of wastes;
- i. Adequate provision by developers for the collection, intermediate storage, treatment and disposal of solid and liquid waste;
- j. Licensing and monitoring of environmental sanitation service providers;
- k. Tariffs for environmental sanitation services and their collection by contractors, franchisees etc;
- l. Ownership of wastes;

## **II) Protection of the sanitation of the environment**

### **a) Pollution of Water and air**

- 1. Measures to prevent pollution of water for consumption.
- 2. Measures destined to prevent pollution of potable water.
- 3. Anyone who offers the public with water to drink or for human food, and which includes frozen food should ensure that the water conforms to the potability norms and regulations.
- 4. Management and disposal of hazardous wastes;
- 5. Storage of wastes on the premises of waste generators;

#### b) Atmospheric pollution

1. Enforce regulations and measures necessary to combat all elements of pollution and protect the natural level of the environment and public health.
2. Measures for the prevention and fight against noise and other alternative nuisances have to be observed at the local premise, environment premises and main agglomerations.
3. Allowable toilet systems and excreta disposal methods;
4. Rearing and straying of animals and pets;
5. The activities and behaviour of individuals and institutions, which cause or are likely to cause environmental pollution or vector breeding;
6. Individual and communal recycling of wastes;
7. Any other matters that demand local regulation to achieve and maintain a clean and healthy environment;

#### c) Mortuary and Cemetery

1. The conditions about running of mortuaries are precisely by means of regulations.
2. Each town or agglomerations has to have a cemetery. The competent authorities are charged to assure the maintenance and protection of the cemeteries.

### **III) Hygiene Measure**

#### a) Food Hygiene

1. The establishments for the preparation, sale and conservation of food products have to be clean, aired and fresh. The consortium about the sale and material contact with food products have to be free from all contamination.
2. Banned from the preparation, conservation, packaging of foodstuff of chemical products and other elements and objects contrary to sanitation norms and juridical sensitivity to undermine the health of the population.
3. All people working in manufacturing establishments and sale of foodstuff must be compliant with the measures of sanitation control, prevention and treatment.

#### b) Hotel, Restaurants and Bar Hygiene

1. All establishment for hotels, restaurant or bar must be in a state of good hygiene and compliant with continuous sanitary control. The functioning and operation have to conform to sanitary norms and juridical enforced to guarantee health of the population.
2. The disinfections of establishment of hotels, restaurant or bar have to be effected periodically by public hygiene agents or the enterprise.

#### IV) Housing-related Measures

1. In all agglomerations where sewage exists, any new building established in the avenue should be connected in order to drain directly rainwater, domestic wastewater and industrial wastewater.
2. Inclusion in development permits of conditions to prevent over crowding, pollution, blockage of drainage channels, blocking of easement and encroachment on building reservation areas.
3. Enforcement of construction/provision of domestic toilets in every residential, commercial and industrial property;

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