My Case Study

By Humberto Estrada

1. **What are 4 common African disease? (list 4)**
   - Onchocerciasis (2)
   - Lymphatic filariasis (3)
   - Hookworm (6)
   - Guinea worm (7)

2. **What do you suspect the disease is? What is the means of transmission or usual reservoirs? (18)**
   - Loa loa filariasis
   - Disease caused by the nematode worm
   - Humans contract this disease through the bite of a Deer fly or Mango fly

3. **What is the microbial virulence mechanisms contributing to the disease process? (19)**
   - Flies breed in fast flowing rivers
   - Well oxygenated water
   - Larvae have an obligatory aquatic stage; they require high oxygen tension
   - The infective larvae enter the body through the bite of its host fly
   - Larvae then move to the subcutaneous tissues; they become encapsulated within nodules and mature into adults in approximately one year
   - After mating the female sheds microfilariae (The microfilariae are sheathless with sharply pointed, curved tails)
   - Microfilariae can be found free in the fluid within the nodules and in the dermal layers of the skin spreading away from the nodules containing the adult; can be found in the blood and eye during heavy infections
   - They infect their fly vectors while the flies are feeding on the human host and mature into third stage

4. **What is the etiologic agent; general characteristics? (10)**
   - Parasitic worm; a helminthic worm
   - Onchocerca volvulus
   - Of the family filariidae (which can live in the human body for up to 14 years)
   - Male: 2-3 cm long; female: 60 cm long
   - Adults occur in the subcutaneous tissues and in nodules
   - Microfilariae: 1000-3000 produced per day per adult female worm
   - Adult worms have a longevity of 10-15 years

5. **What is its historical information to include, who isolated the microbe, & give any significance of its name? (16)**
1874, John O’Neill, determined to look for the cause of this peculiar condition, which was known locally as “craw-craw”, O’Neill examined the contents of pustules and vesicles, success attended his efforts for he found an organism which he had no doubt, was the cause of the complaint.

1890, an unnamed German doctor working in the Gold Coast (Ghana), West Africa, removed two tumors, on examining found they contained worms and sent them to Rudolf Leuckart in Germany for identification; parasite was labelled “Filaria volvulxus”.

1915/1916, Rodolfo Robles and Pacheco-Luna in Guatemala in Ophthalmic symptoms and signs, red skin inflammation, a skin disease located on the face, Conjunctivitis and iritis of the anterior segment of the eye.

1920, itching and consequent scratching which led to the rediscovery by Montpellier and Lacroix; found microfilariae in the dermal layer of the skin examining members of native troops in Africa suffering with a form of itch or “craw-craw”.

1923, the Briton, Donald Breadalbane Blacklock, investigated the mode of transmission.

1923/24, observations of the blackfly were biting in great numbers near streams supplying several of the villages in an endemic area of onchocerciasis.

In 1925, flies were captured and only the female was found biting, and the biting habit is diurnal.

1930/1931, Hissette reported patients with onchocerciasis were blind…Americans finally confirmed river blindness caused by onchocerciasis.

1944, Harold Ridley’s monograph Ocular onchocerciasis was of considerable success in river blindness research.

1958 Choyce confirmed onchocerciasis was identical with the choroidal sclerosis described by Sorsby in 1939.

Onchocerca volvulus epidemiological evidence suggests prepatent period between 3 to 18 months; adult worms may live for 15 years and are capable of producing microfilariae for up to ten years while microfilariae may persist for from 6 months to 3 years.

1987, Merck donates drug Ivermectin to affected areas.

6. **What are common signs and symptoms of the disease?** (17)

- Infected persons may be without symptoms
- Intense itching
- Skin rash and discoloration
- Eye lesions
- Subcutaneous bumps (nodules) under the skin (skin becomes depigmented after the lesions heal)
- Serious manifestation consists of lesions in the eye; can progress to blindness (microfilaria can be seen swimming in the chamber of the eye-worms reach the end of their life cycle and die in the eye, result is an inflammatory reaction that causes uveitis, vitritis, retinitis and ultimately blindness
- Cornea commonly affected, resulting in severe keratitis, scarring and blindness
- Inflammatory reactions can result in secondary glaucoma, which can lead to blindness

7. **List any control or treatment for the disease** (12, 13)

- People who are found to be infected should be treated in order to prevent the long-term skin damage and blindness.
-recommended treatment is ivermectin, given for the life span of the adult worms or for as long as the infected person has evidence of skin or eye infection; kills the larvae and prevents them from causing damage but it does not kill the adults
- promising new treatment using doxycycline that kills the adult worms by killing the Wolbachia bacteria on which the adult worms depend in order to survive
- Ivermectin not only prevents ocular disease but also improves and eliminates the skin disease
- Ivermectin temporarily decreases the release of microfilariae, but it does not kill adult worms.
- frequency/duration of ivermectin therapy still is being debated
- studies have shown administration of doxycycline in addition to ivermectin therapy led to Wolbachia depletion followed by interruption of embryogenesis and reduction in microfilarial loads
- A study of doxycycline use without ivermectin showed a reduction in live worms in nodulectomy specimens
- Additional studies using azithromycin or rifampicin for Wolbachia eradication have been less efficacious than studies using doxycycline
- Research may support the use of these agents as alternatives for those intolerant of doxycycline.
- Suramin is used less often than ivermectin and given intravenously.

8. Are there any prevention programs, current research about a vaccine or other means of control/prevention? (11)
There are many prevention programs, one program is the Carter Center that works with national ministries of health in Latin AMERICA and Africa to eliminate river blindness. Others are:
- Conference on the Eradicability of Onchocerciasis
- Onchocerciasis Elimination Program for the Americas (OEPA)
- national onchocerciasis programme in six countries
- 19 countries in Africa plus Côte d’Ivoire and Sierra Leone & Yemen
- surveillance systems in Benin, Ghana, Guinea and Togo

9. Include prevalence and/or incidence of current cases or outbreaks (globally or locally) (8, 9)
- Out of some 120 million people world-wide who are at risk of onchocerciasis, 96% are in Africa.
- Of the 36 countries where the disease is endemic, 30 are in sub-Sahara Africa (plus Yemen) and six are in America.
- A total of 18 million people are infected with the disease and have dermal microfilariae, 99% are in Africa.
- Over 6.5 million suffer from severe itching or dermatitis and 270 000 are blind.
- 37 million infected people live in West, Central and East Africa, with smaller foci in Latin America and Yemen.
10. Later it is found the parasite can only be observed between specific times. What are those times and what is hypothesized? (5, 15)

It’s Loa Loa, the parasite can only be observed between 11:00 a.m. and 1:00 p.m. The tests all have to be done during that timeframe; they are only present in the bloodstream. The cause of this periodicity remains unknown, but the advantages of the microfilariae being in the blood during these hours may ensure a higher chance of transmitting themselves elsewhere. Physiological changes also are associated with sleeping, such as lowered body temperature, oxygen tension and adrenal activity, and an increased carbon dioxide tension, among other physical alterations, any of which could be the signals for the rhythmic behavior of microfilarial parasites.

11. Are there any devices or types of equipment to take to the field to assist in confirming the ‘bug’? If so what is being used? (4 & 5)

Smartphones might soon be able to help cure a disease. Scientists are hoping to use a souped-up iPhone as a microscope. The traditional way of making the measurement involves taking blood smears, looking at them under a conventional microscope and counting them manually. So a river blindness expert at the National Institutes of Health developed a device that could quickly and reliably detect Loa loa in a drop of blood.

A health worker collects pin-prick of blood in a small glass tube and pushes it into a compact and inexpensive microscope adapter that connects to the iPhone. You press GO, the phone controls...
the movement of the sample, takes a video and an analysis & give a result and tells the health
worker whether it's safe to give the person ivermectin.
Use of this technology to exclude patients from ivermectin-based treatment at the point of care in
Loa-endemic regions would allow resumption/expansion of mass drug administration programs
for onchocerciasis and lymphatic filariasis in Central Africa.

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