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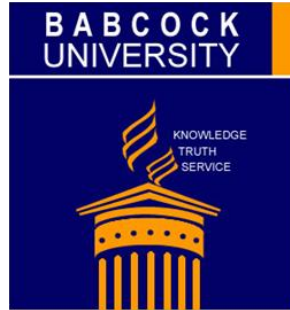
PARASITIC INFECTIONS: Challenges of Control and Eradication in Public Health

Lecturer:

**Professor Dora
Olufunmilola Akinboye**
AIMLT, FIMLT, FRHD, M.Sc., Ph.D., (Ibadan)

Thursday, Oct

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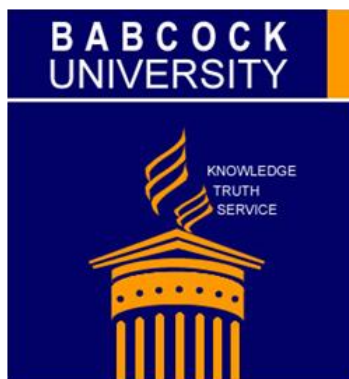
**PARASITIC INFECTIONS: CHALLENGES OF CONTROL AND
ERADICATION IN PUBLIC HEALTH**

BY

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Parasitic Infections: Challenges of Control and Eradication in Public Health

Preamble

I welcome everybody to this Inaugural Lecture in this great Babcock University. This is the first inaugural Lecture to be given in the Department of Public Health, the first in the School of Public and Allied Health and the sixth in Babcock University.

I appreciate this great honour, given to me, to present this Inaugural Lecture, with gratitude and humility. I regard this as a unique, lifelong opportunity, to give an account of my stewardship and become an Inaugural Lecturer, in this great Institution!

The title of my Inaugural Lecture is: *Parasitic Infections: Challenges of Control and Eradication in Public Health*.

I will start by explaining the meanings of the word, 'Parasite'.

- (1) Organisms which live and feed on, or which live in another organism, of a different species (referred to as host) and which cause harm to the host, are referred to as parasites.
- (2) Also, a person who constantly takes advantage of the generosity of other persons, without contributing, or giving, or making any useful impute, is usually referred to as a parasite.
- (3) Finally, a professional lunch or dinner guest, one who comes only when food is ready, was also referred to as a parasite in Ancient Greece, (*Webster's New World College Dictionary, 2010*).

The word parasite was first used in the 16th Century. *Para =1: plus sitos*, which means food of an unknown origin. Scientifically, this means an "animal or plant that lives on others". Parasites

are usually harmful to their hosts, however, the damage they do differ widely. This varies from minor problems to incapacitating (debilitating, devastating etc) and fatal diseases which could be deadly and incurable. Parasitic diseases are some of the leading causes of global mortality, with higher burdens of prevalence in developing countries, especially in regions of the world, characterised by contaminated water, coupled with poor personal hygiene and poor sanitary treatment of food by handlers, (Arora, 2010).

Parasites are also differentiated in diverse ways, depending on their characteristics: those that live on the outside of the body and feed from the outer part of the host's body are called ectoparasites. Insect parasites are responsible for numerous, serious diseases. These include flies, ticks, mosquitoes, sand flies, tsetse flies and many others, (Crystal, 2014). References will be made to some of these and the diseases they cause.

Sometimes, ectoparasites do not usually cause disease but invariably, they bite and their bites are always itchy, irritating, and painful. The most important aspect is that they transmit so many various diseases. They frequently transmit organisms which cause different types of diseases, which include parasites, bacteria and also viruses. There are also mechanical transmitters of diseases.

I wonder if anybody here has come face to face, in the wild, with a lion, a bear, shark, python or a leopard? This is very unlikely because human beings have planned to avoid these dangerous wild animals. On the other hand, we under-estimate and give little attention to parasites, which are smaller and equally dangerous like the big animals mentioned. Therefore, we have not been able to eradicate parasites because we have failed to have adequate plan to wage war against them. This is one of the major challenges which the human race is facing. We have failed to plan, to control, or to eradicate parasite, mainly because of our careless, nonchallant ways of life and also due to ignorance.

Since some of these parasites are small, they hibernate in various places. The ecto parasites hide in corners and crevices of furniture, wallpapers, cracks in walls, mattresses, and clutter provide nesting spots for the small, flat insects. They like to live near people or pets, and they emerge to feed on human blood, while people are fast asleep. Bed bugs (Fig. 1) have not been known to cause disease, but the bites might cause allergic reactions. Scratching the bitten area too much could expose the affected area to secondary infection. Antiseptic creams or lotions could be used and an antihistamine might also be taken, to ease the itch, (Blahd, 2015).

Tsetse fly transmits the parasites that cause sleeping sickness (*Trypanosomes*). Mosquitoes transmit *Plasmodia* which cause malaria, *Simulium damnosum*, which causes onchocerciasis, river blindness, and leopard skin, are also vectors of diseases. Others are sand flies, kissing bugs and ticks lyme diseases, and etc. These inflict a lot of pains on humans, and also transmit diseases, to both animals and humans, (diseases transmitted, from animal to man, are referred to as zoonotic diseases).



Fig.1: A bed bug (Blaht, 2015).

Malaria parasites are usually transmitted by mosquitoes. There are four species of mosquitoes which transmit malaria. These are *Plasmodium* (*P.*) *species*, which are *P. malariae*, *P. falciparum*, *P. ovale* and *P. vivax*, that transmit the disease through the bite of an infected female *Anopheles* mosquito. Although malaria is a curable disease, if diagnosed and treatment commenced on time, its control and eradication will no more pose so much problem, which has failed to abate.

According to Peletiri, (working in Nigeria), seven major obstacles against the control and eradication of malaria, have been identified and therefore need to be surmounted, (Peletiri 2013). The seven major obstacles identified were:

- (1) the environment
- (2) behaviour (patients' attitude),
- (3) clinical diagnostic inadequacies (medical doctors' attitude),
- (4) medical laboratory diagnostic inadequacies,
- (5) therapeutics' inadequacies,
- (6) drug resistance, and
- (7) government policies.

The insect called louse, (Fig.2) lives on humans and sucks blood. Three types exist: the first type lives on the head, the second lives on the body, while the third lives within the pubic hair. The only one which spreads diseases is the body lice. They crawl about, therefore a person can get infected through contact with someone who is close. While sitting on chairs, cushions and in public places, it is advisable to sit on long cloth/dress because clothes are protective. This is one

of the disadvantages of wearing skirts and shorts which are too short and cannot protect people from sitting on contaminated materials. Lice lay eggs on the host, and itching commences when they hatch. They can be treated with over-the-counter prescription medications and specified types of shampoos.



Fig. 2: Lice (Blahd, 2015).

Mites (Fig. 3) dig into the skin and lay eggs, causing itching and irritation. It can be spread through skin-to-skin contact with an infected person. (This is one of the disadvantages of borrowing or sharing clothes.) Symptoms include itching, especially at night, spotty rashes, sores, and very crusty patches. This can be treated with a special medication called scabicide.



Fig. 3: Mite (Blahd, 2015).

Chigoe Flea

This is a zoonotic parasite known by various names but the commonest is Jiggers. The breeding female digs its way into the feet of man or mammals and it lays eggs and feeds on the tissue.



Fig. 4: Flea [Jigger] (Blaht, 2015).

Screw Worm Fly

The fly lays its larvae in the flesh of mammals and man, and the maggots which are produced grow very rapidly and consume the flesh of the host, (Fig 5). It is believed that this is what was referred to in the Bible where references were made to various worms, which are now termed “parasites”, and these can be found in many places. Examples were where humans were eaten up by worms:

Mark 9:48– English Standard Version (ESV) “*where their worm does not die and the fire is not quenched.*”

Acts 12:23–ESV/17, “*an angel of the Lord struck him down, because he did not give God the glory, and he was eaten by worms and breathed his last.*”

Acts 12:20-23–ESV/13, “*now Herod was angry with the people of Tyre and Sidon, and they came to him with one accord, and having persuaded Blastus, the king’s chamberlain, they asked for peace, because their country depended on the king’s country for food. On an appointed day Herod put on his royal robes, took his seat upon the throne, and delivered an oration to them. And the people were shouting, “The voice of a god, and not of a man!” Immediately an angel of the Lord struck him down,*

because he did not give God the glory, and he was eaten by worms and breathed his last.

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Jonah 4:7 ESV/6. "But when dawn came up the next day, God appointed a worm that attacked the plant, so that it withered."



5a 5b
Fig. 5: Screw worm maggots (Blahd, 2015).

The fly critter smartly deposits larvae in the flesh of unsuspecting host. The larvae develop and the host has self-developed maggots (fig. 5). The presence of the maggot can be painful and very irritating. When the fly wants to deposit the larva, it smartly touches the skin or any sight of the body. The host cannot imagine that the fly is laying a larva! Please be weary of allowing insects to alight on you. Smartly clean off the spot. Sometimes you may have, as part of the life cycle, a big swelling on any part of the body, (Figs. 6 and 7) and it may be referred to as a boil: when it is pressed out, something whitish, semi-solid larvae, comes out and the host will be happy that it has come out, then you throw it away, helping it to go and continue with its life cycle. Also it is not everything called pimple, that is actually pimple, some are larvae.

There are still many more examples but I have highlighted only a few of the important ones which people may not be conversant with.

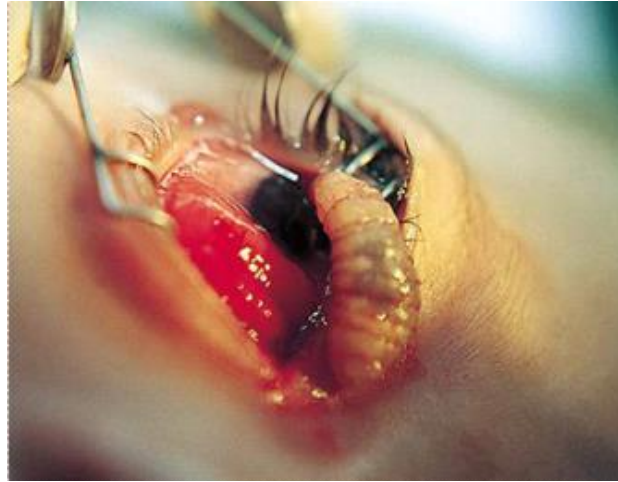


Fig. 6: Larva of human Bot-fly in a human eye, (Blaht, 2015)



Fig. 7: Human bot-fly, (Blaht, 2015).

Endoparasites

Parasites which live inside the body of its host are called endoparasites. These include organisms which live within the host's organs, tissues and also unicellular parasites like sporozoans which invade the host's cells.

Protozoa

Making up approximately 70 percent of all invading organisms, protozoa are invisible to the naked eye. They are one-celled, microscopic organisms, but do not let their size fool you. Certain protozoans, through their intensely rapid reproductive ability, can take over the intestinal tract of their host, and from there, go on to other organs and tissues. Some feed on red blood cells. Some protozoa produce cysts (closed sacs in which they may be safely transported through food and

water, from one person to another). In the cystic state, protozoans are safe from destruction by human digestive juices. These one-celled ‘vampires’ can actually destroy the tissues of their hosts. Common protozoa include: *Endolimax nana*, *Giardia lamblia*, *Entamoeba histolytica*, *Cryptosporidium parvum*, *Blastocystis hominis*, *Trichomonas vaginalis*, *Toxoplasma gondii*, *Cryptosporidium muris*, *Pneumocystis carinii*, *Plasmodium (P.) malariae*, *P. ovale*, *P. vivax*, *P. falciparum*, *Leishmania donovani*, *Leishmania tropica*, and *Leishmania braziliensis*, (Fig 8).



Fig. 8: *Leishmania* (The American Heritage® Science Dictionary)

Malaria parasite

The term malaria, is very common in Nigeria, although people do not know much about it. The organism which causes malaria infection is a parasite. It is an obligate, intracellular sporozoan, in the genus *Plasmodium*, with the following species: *P. malariae*, *P. vivax*, *P. falciparum* and *P. ovale*, all of which infect man. All forms of human malaria are spread primarily by the female *Anopheles* mosquito. Development of malaria parasite is divided into two phases which are asexual, (which takes place in humans) and sexual (which takes place in *Anopheles* mosquitoes).

Sexual phase is the starting stage, at which humans are infected. Infection starts when an infected female *Anopheles* mosquito injects saliva which contains anticoagulant (to prevent blood from clotting during feeding) into the blood capillary, in preparation for feeding on blood (to take a blood meal). During this process, asexual cells called sporozoites are injected into the person's blood circulatory system, where they develop further, causing various symptoms like fever, headache, loss of appetite, fatigue, vomiting, anaemia etc. Pregnant women and under five children are most vulnerable to malaria and if not promptly treated, can lead to death.

Mode of Transmission of Parasites

Parasitic infections can be transmitted in diverse ways, depending on the nature of the parasite. Animals, just like humans, can become infected with parasites. Internally, contaminated water and food can spread some infections to pets. Externally, animals become infected by organisms on their bodies, especially on their fur, because of exposure to infected animals. Forgetting to

wash hands even one time, after handling or cleaning up an animal can transmit the parasite to humans. Pets are a wonderful part of human lives. They provide comfort, companionship, protection, amusement, and unconditional love for their owners. Yet, pets, like humans, are often victims of serious infections that can unintentionally be passed on to the owners. There is a whole set of diseases classified as ‘zoonoses’ (a disease which can be transmitted from animals to man) (animal-transmitted diseases). Animals are major carriers of harmful organisms, and the general public are seemingly unaware of this fact. The potential for transmission of parasitic infection from animals to humans is extremely high. Making a parasite cleanse is an essential part of an effective health maintenance programme for both humans and animals alike.

Food and water are the most common sources of parasite and invading organism transmission. Since most humans eat three times a day and drink water frequently, exposure to these sources is constant. Tap water has been found to be contaminated with harmful organisms. Both plant and animal foods can transmit parasites; and cleaning and cooking methods do not often destroy them before ingestion. Most are linked to restaurants and delis where less than normal sanitary conditions exist, from food preparation and storage to the utensils and servers’ hands.

A pilot study was recently conducted in Babcock University, to appraise food handlers, (Akinboye, *et al*, 2015). It was observed that 53.3% of the handlers harboured various parasites, some of which have been. The research was sponsored by Babcock University administration. The research team is very grateful for this. It is hoped that the administration will still sponsor the remaining aspect of the research.

Oral transmission of parasites can occur through the following:

1. Infection can occur by eating raw or undercooked meat, particularly pork, lamb or venison which may contain the cyst of *Toxoplasma*: (Toxoplasmosis infection is prevalent in countries where undercooked meat is traditionally eaten and accepted as a delicacy).
2. Parasites or their cysts may also be ingested through hand-to-mouth contact during the handling of undercooked meat, or while using contaminated knives, kitchen utensils or cutting boards which have been used for raw meat.
3. Through the eating of unwashed fruits or vegetables which have been in contact with contaminated soil that has come in contact with feces.
4. Ingestion of feces, which may be due to hand-to-mouth contact after gardening, handling or cleaning of a cat’s faeces box or handling children’s sand pits. This is because some parasites (or ova) can survive in an environment for over one year.

Trematodes

Trematodes are leaf-shaped flatworms which are also known as flukes. They are parasitic during nearly all their life-cycle. The cycle begins when larvae are released into freshwater by infected snails. The free-swimming larvae can then directly penetrate the skin of human hosts or are ingested after encysting in or on various, edible vegetation, fish, or crustaceans. Common trematodes include: Intestinal fluke (*Fasciolopsis buski*), Blood fluke (*Schistosoma* (s.) *japonicum*, *mansoni*, (Fig.9), *haematobium*), Liver fluke (*Clonorchis sinensis*), Oriental lung

fluke (*Paragonimus westermani*), and Sheep liver fluke (*Fasciola hepatica*, [Mehmet and Oprah, 2015]). Schistosomiasis is a chronic granulomatous disease caused by a group of digenetic trematode worms known as *Schistosomes*, (Jordan, 1986). The disease is also referred to as snail fever or bilharziasis and it is believed that it was already known in Egypt and Mesopotamia as early as 1900 B.C. (Ansari, 1973).

Urinary Schistosomiasis: Water Contact Frequency and Infectivity among Secondary School Students in Ibadan, Nigeria. (Akinboye, D.O., Ajisebutu, J.U., Fawole O., Agbolade, O.M., Akinboye, O.O., Amosu, A.M., Atulomah, N.O.S., Awodele, O., Oduola, O., Owoduni, B.M., Rebecca, S.N., Falade, M. and Emem, O., 2011)

A multidisciplinary research was conducted to investigate if students in some schools, which were located near a stream, were well informed about transmission of schistosomiasis and to determine if snails in, and around the stream were infected. The study was conducted among three secondary schools in Ibadan North Local Government Area of Oyo State, Nigeria, using the Ajibode stream, situated along Ajibode village, in the same Local Government Area, as the project area. A total of 205 students were examined, for the presence of *Schistosoma* (*S.*) *haematobium* ova from the three secondary schools. In one of the schools, 60 students served as controls because it was located far away from the stream. Also, 145 students from the other two schools were selected and examined because of their proximity and accessibility to the stream. Water-contact frequency and knowledge of the cause of schistosomiasis among the students were investigated. Surroundings were examined for *Bulinus globosus*, the intermediate host of *S. haematobium*.

Snails found were examined for sporocysts. Water samples, from the stream were examined for miracidia and cercariae. There was no significant difference between the prevalence of urinary Schistosomiasis among male and female students in the two schools. The species of snails found in the stream were *Bulinus globosus*, *Lymnea natalensis* and *Laniste slybicus*. Cercariae shedding occurred in only one of the *Bulinus globosus* snails. However, upon dissection, the presence of sporocysts confirmed infection in other *Bulinus globosus* snails. The presence of these confirmed that the stream was infected.

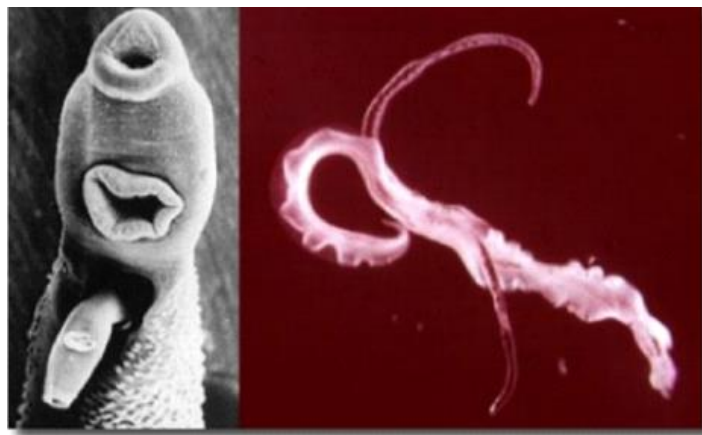


Fig. 9: *Schistosoma haematobium* (adapted from the life tree)

Nematodes

Nematodes are multi cellular parasites. The adult worms multiply by producing eggs called ova or larvae. The eggs usually become infectious in soil or in an intermediate host before humans are infected. It is interesting to note that unless the worm infection is heavy, many individuals do not show symptoms of infection. A human host can coexist quite comfortably with a few worms, but if they reproduce in great numbers, they can create organ obstruction. Researchers have established that ‘some types of worm are in the intestines of over 75 percent of the world’s population’. This is a frightening statement. Common nematode include: Roundworm (*Ascaris lumbricoides*), Hookworm (*Necator Americanus*, *Ancylostoma duodenal*), Pinworm (*Enterobius vermicularis*), Roundworm (*Toxocara canis*, *Toxocara cati*), Heart worm (*Dirofilaria immitis*), *Strongyloides* (*Strongyloides stercoralis*), *Trichinella* (*Trichinella spiralis*), Filaria (*Wuchereria bancrofti*, *Brugia malayi*, *Onchocerca volvulus*, *Loa loa*, (Fig. 10) *Mansonella streptocerca*, *Mansonella perstans*, *Mansonella ozzardi*), and *Anisakine larvae*. (Mehmet and Oprah, 2015).



Fig.10 : *Loa loa* (Mehmet and Oprah, 2015)

Another nematode is called *Dracunculus medinensis* (Fig. 11) known as (*sobia* in Yoruba), the days of spreading this disease are nearly over. People are infected by drinking water from ponds infected with the larvae. The worms mate and grow in the stomach, migrate to the tissue then burst out through a blister on the skin. Symptoms can include fever, swelling, and pain, near the blister. This usually takes a year after infection, for warning signs to show up. There is no specific treatment.



Fig. 11: *Dracunculus medinensis* (Mehmet and Oprah, 2015)

Another parasite, which is known as *N. fowleri*, (Fig.12) lives in warm freshwater, and it enters the body through the nose. It causes a condition that destroys brain tissues called primary amoebic meningo encephalitis. Symptoms include headache, fever, vomiting, confusion, stiff neck, seizures, and loss of balance. Only experimental treatments are currently available now, so the survival rate is low.

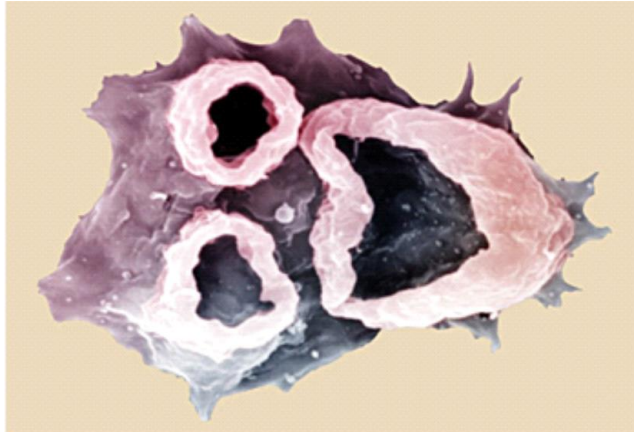


Fig. 12: *N. fowleri*, (Mehmet and Oprah, 2015).

Another parasite is called *Ascaris lumbricoides*. It infects animals and humans through waste, fecal matter and through food that has been mishandled or undercooked, (Fig. 13)



Fig. 13: *Ascaris lumbricoides* (Mehmet and Oprah, 2015)

Cestoda

These are tapeworms, which are given this name because they look like tape measures. They are believed to be humans' largest intestinal parasite. They are so large that they are readily visible to the naked eyes. The length of a tapeworm can be as long as 6 metres (20 feet). They are difficult to treat because each one has a head, called scolex, which attaches firmly to the intestinal wall. While the head remains attached to the intestine, a new long worm can always develop and grow from it! Tapeworms obtain nourishment (food) by absorbing and sharing

partially digested food substances from the host, (Fig.14). The commonest cestoda include: Beef tapeworm (*Taenia saginata*), Pork tapeworm (*Taenia solium*), Fish tapeworm (*Diphyllobothrium latum*), and Dog tapeworm (*Dipylidium caninum*), (Mehmet and Oprah, 2015).

This is a parasite which infects people when they eat raw or undercooked pork, (pig meat). Humans and pigs may have this parasite (zoonosis). They infect when the egg is swallowed from contaminated food, pork or water. Coming in contact with the faeces of an infected person also transmits it. This parasite infects the intestines and brain, (Fig. 14) in which case, it causes headaches and seizures.

In the first instance, God does not want us to eat pork, (pig meat): this is stated in the Bible. In Leviticus Chapter 11, God specified what to eat and what not to eat. In verse 4, it was stated “Nevertheless, among those that chew the cud or part the hoof, you shall not eat these, (which were stated): [verse 7], and the pig, because it parts the hoof and is cloven-footed but does not chew the cud, is unclean to you”.



Fig. 14: Pork tape worm ((Mehmet and Oprah, 2015)

An infection leading to diarrhea, gas, stomach cramps, bloating, and nausea, is likely to be due to *Entamoeba histolitica* or *giardiasis* (Fig. 15). Infection is through food or drinking water, or from contact with the faeces of an infected person or animal. The infection can be treated with prescription drugs.



Fig. 15: Giardia, (Mehmet and Oprah, 2015)

This parasite can be passed through sexual contact. It causes sexually transmitted disease (STD) called trichomoniasis (Fig.16), it is the most common curable STD. Most infected people don't have any symptoms, but some may notice itching, burning, or irritation of the penis on vagina. It can be treated with antibiotics.



Fig. 16: *Trichomonas Vaginalis*, (Mehmet and Oprah, 2015)

Blood

Trypanosomes are parasitic flagellates found in the blood and the disease can be life-threatening. The parasite are usually transmitted through the bites of various insects (vectors). Examples are sleeping sickness and chagas disease (Fig. 17). Symptoms vary but can show up quickly as fever, fatigue, aches, headache, rash, loss of appetite, diarrhea, vomiting, sleepiness and swollen eyelids. Later, it can lead to heart and intestine problems and death. The disease can be treated with medication.

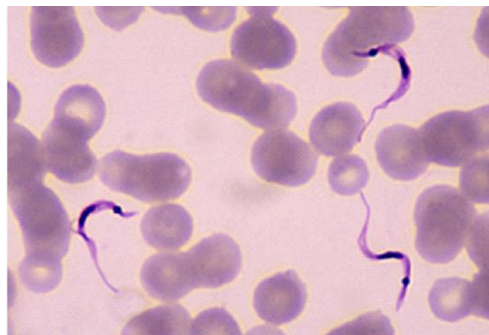


Fig. 17: Trypanosomes, (Mehmet and Oprah, 2015)

Some infections are spread because an insect acts as a vector, or carrier, of the disease and transmits it while feeding on the host. Malaria, which is transmitted by mosquitoes, is one such example of parasites which is transmitted by vectors. Information about malaria has been written earlier in this presentation under protozoa.

People at Risk

There is nobody who cannot be infected with parasitic infections although some people are at greater risks than others. Tropical and subtropical regions are more suitable for the development of parasites because the environment is warm and moist. Travellers to these areas and also the regular inhabitants are at more risk of getting infected than others.

Sub-Saharan Africa is particularly prone to parasitic infections. When I was teaching this aspect in one of my classes, the students did not agree with me that they could be harboring parasitic diseases.

Sub-Saharan Africa is particularly prone to parasitic infections. When I was teaching this aspect in one of my classes, the students did not agree with me that they could be harboring parasitic diseases. I therefore gave each of them two universal bottles and asked them to bring urine and stool samples to class during the six hour practical class. It was detected that 75% of them had one type of infection or another and some had multiple infections with endoparasites. During another practical class, it was blood samples only that we examined. With ordinary screening methods, 35% had malaria parasites (with microscopy), and with concentration method, 80% had malaria parasites! This was similar to the finding of Mehmet and Oprah, (2015), who stated that 85% of Americans harbored parasites.

Mr. Vice Chancellor Sir, if everybody in this room is screened (examined) for various parasitic infections, we may find out that about 80 to 85 % of all the audience, or even more, can be harboring some of those parasites I have shown you. This is one of the reasons why it is recommended that everybody should endeavour to go for a comprehensive medical check up, at least once or twice in a year, (depending on the age)! Please note that Babcock University Teaching Hospital is recommended for this purpose. This is a good method of controlling parasitic infections because an infected person will not pass on the infection to other people, (or animals).

Some people are more prone to infections than others; for example, a person who is already sick or has compromised immune system is at risk of infections as well. Individuals who lack potable water are also at the risk of getting infected with parasitic infections. Also, a person who loves to swim in ponds, rivers, stagnant waters or lakes and ingest the water, is also at risk. This should be avoided

It is good to note that cats transmit a type of protozoan disease called toxoplasmosis. The disease is very harmful for pregnant women. Let me sound this note of warning that, a person who is pregnant and has a cat, should avoid cleaning the cat's faeces or coming in contact with the faeces. Child care workers who come in contact with faeces of various children, on regular basis, are also at risk of parasitic infections. Such individuals should take necessary precautions, in order to control parasitic infections.

Prevention and Control

Many parasitic infections have been successfully controlled or eradicated in the Western world and among the Caucasians. There are several ways in which a person can be protect from parasitic infections:

1. Drink clean, bottled water at all times and especially when travelling. Boiled and thoroughly filtered water are also adequate.
2. Pregnant women should avoid cat litter and feces.
3. Practice safe sex and avoid “peck and go”. The Bible injunction should be adopted in this aspect. Take note that there should be no premarital sex at all and after marriage, strictly, keep to one partner or else, you will be contravening God’s commandment in Exodus Chapter 20, verse 14. (Thou shall not commit adultery).
4. Wash hands with soap, especially when coming in contact with contaminated food, water, and feces
5. Wash hands after visiting restrooms, (toilet rooms).
6. Do not suck fingers and prevent children from sucking fingers, (they easily get infected with bacteria and parasites. A child who has diarrhea must have contacted an infection, immunity is lower during teething; teething itself does not lead to diarrhea.
7. Never do mouth to mouth kissing with babies or children, they easily get infected. Some organisms are pathogenic to babies and children but not to adults.
8. Cook food to recommended temperatures and practice good hand hygiene.
9. Avoid swallowing water in lakes, swimming pools, streams, or ponds.
10. Do not wade in streams or rivers unless you are sure that they are not contaminated.
11. Avoid biting insects of all types because they transmit parasites.
12. Get rid of house flies from the environment.
13. Clean the environment regularly without being forced to wait until environmental sanitation days.
14. Use disinfectants where and when necessary.
15. Use insecticides according to instructions on the labels.
16. Clean bushes around dwelling apartments.
17. Bath regularly.
18. Use all drugs according to the physicians/pharmacist’s prescriptions.
19. Never allow pets to wonder about or play outside your compound without being held or controlled on a leash (because by wondering about, they pick up ecto and endo parasites).
20. Bath and deworm pets regularly, check their furs for ecto-parasites, especially ticks. Never crush ticks because after crushing, the ova will hatch and continue to develop. Throw them into the fire to destroy them.
21. Deworm children at least once in six months, (physicians in BUTH should be consulted to give information about appropriate doses for specific ages). Please note that parasitic infections retard assimilation in children, (Akinboye, 2001).

Mr. Vice-Chancellor Sir, this point should be taken seriously because this may be the reason why many children continue to fail in school!

22. While opening books, do not use your saliva to dampen your finger. It is even worse if this is done while counting money, please correct anybody you see, who is doing this, it is not a good habit, (because you can infect yourself and possibly others unknowingly)!

These rules are many but to remain healthy, they can all be kept. Many parasites have been eradicated in many countries but a major problem is that, in this part of the world, when we are taught many things, we find it difficult to take correction and practice what we are taught! If all these can be put into practice, then many parasites will be controlled or even eradicated! It is interesting to note that when I teach students about all the above prevention and control methods in class, many questions and comments arise. I will share just one with you, because of time. “Ma, these rules are so many, and difficult to keep, however we see mad people who feed from refuse sites, drink dirty water, and still remain strong, does that mean they have immunity to all these things you have mentioned may be we also have immunity like that too”. The simple answer is, mad people fall sick and die off, if not taken care of! The question now is, have you ever seen a person who was mad from youth, and remains mad until old age, which is, being crazy (mad), for up to a period of 50 years or more? No is the answer!

Symptoms

Parasitic infections are numerous, therefore the symptoms vary. Most intestinal parasitic infections cause gastrointestinal symptoms which lead to stomach cramps and pains, greasy stools, diarrhea, gas, stomach upset and nausea. Parasitic infections may also lead to itching, vomiting, fever, dehydration, chills, headache, flu-like symptoms, weight loss, lack of assimilation, muscle pain, swollen or painful lymph nodes, etc. Sexually transmitted parasitic diseases may and may not have major symptoms. However, common symptoms include itching, redness, irritation, and an unusual discharge from the genital. A very unpleasant foul smell may also be included.

Diagnosis

There are many methods for diagnosing parasitic infections. In a fecal examination, also called stool examination or an ova parasite test, sample of stool is taken and analysed to check for parasite eggs. An endoscopy or colonoscopy can be used if stool examination is inconclusive. In an endoscopy or colonoscopy, a tube with a camera on the end is placed into the mouth or rectum. It is then passed through the digestive system so that the intestines can be examined .

In some cases, a blood test can reveal if your infection is caused by a parasite. In extreme cases, x-rays, magnetic resonance imaging (MRI), and computerised axial tomography (CAT) scans can help identify if parasitic infections have caused lesions, or injury to the organs.

Treatment

Not every parasitic infection has a treatment. Some infections can reoccur (come back again) after treatment. Trichomoniasis can be treated with antibiotics. Giardiasis and cryptosporidiosis can also be treated with medications. Toxoplasmosis is not usually treated with medication unless it is severe and prolonged. The best treatment options should be discussed with the

physician. In some cases, the doctor may prescribe or recommend a medication, but because diarrhea often leads to dehydration, be sure to drink plenty of fluids.

My Contributions to Knowledge

These contributions can be grouped into the following:

1. Experimental researches
2. Epidemiology and survey
3. Immunological researches
4. Pathology
5. Disease prevention and control
6. Ecology, vector biology and life cycle
7. Public health
8. Diagnostic parasitology
9. Molecular and biochemical parasitology

All these are with reference to parasitology.

Parasitology and Serological Studies on Malaria Among Blood Donors. (Akinboye, D.O. 1985)

In one of the studies, blood samples were collected from blood donors and were examined microscopically, immunologically and serologically, for malaria parasites. The results were compared, to determine the levels of positivity and sensitivity. Microscopic results yielded 5% positivity, while the other two methods yielded 85% positivity, (Akinboye, 1985). The level of positivity was so high in the immunological study because Nigeria is an endemic region and all the donors tested might have previously had malaria infection, and developed immune antibodies to malaria. The donors who had life parasites (trophozoites) were healthy carriers. It was therefore recommended that patients who were transfused with blood, should be given prophylactic treatment.

Malaria and Loasis among Blood Donors at Ibadan, Nigeria. (Akinboye, D.O. and Ogunrinade, A.F. (1987).

Working further on blood donors, a research investigation was conducted on malaria and *loa loa* parasites, it was observed that there was no relationship between the two variables.

Computers in Parasitological Researches. (Akinboye, D.O. 1998)

The use of computer software was related to parasitological researches and it was found that its application to parasitological researches would enhance and improve such studies.

A Study of Intestinal Parasitic Infections among Parents and their Children. (Akinboye, D.O., 2001)

It interested me to find out if the types of parasites found in parents and their offsprings (children) would be similar or not: indicating possibility of similar sources of infection. There was relationship between the various parasites harboured within the families. There were similarities and differences in the types of parasites harboured. However, there was no

association between intestinal parasites harboured by parents and their offsprings. This suggested that the parasites were acquired from various sources, which could include acquisition within and outside the family setting, (Akinboye 2001).

A Strategy for the Control of Intestinal Parasites among Food Handlers, in a University Environment. (Akinboye, D.O., Fawole O., Akinboye O.O., and Molehin, A.J. 2001)

Also, a strategy for the control of intestinal parasites among food handlers, in a university environment, was designed. This is because food handlers have been tagged as potential carriers of pathogens, which included parasites. Parasitic diseases were some of the leading causes of global mortality, with higher burdens of prevalence in developing countries, especially regions of the world, which are characterised by the use of contaminated water, coupled with poor personal hygiene and poor sanitary treatment of food by handlers. This study was a pilot study, which was designed to ascertain the Public Health safety of food handled by food handlers within Babcock University cafeteria, in Ilishan-Remo, Ogun State, Nigeria.

Prevalence of Intestinal and Urinary Parasites among Food Handlers. (Akinboye, D. O., Abdullah, A.R., Awodele, O, Akintunde, T. I, Effedua, H. I. and Bamidele, E. 2015).

In this study, some food handlers were detected to harbour parasites which included *Trichomonas vaginalis*, *Entamoeba (E.) histolytica*, *Ascaris lumbricoides* and *Trichuris trichiura*. There were also co-infections of *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworm infections and *Entamoeba histolytica*. However, they have all been treated.

The Importance of Vegetation in Malaria Transmission. (Akinboye, D.O., Happi, C.T., Oduola, O., Afolabi, M.A., Akinboye, O.O., and Abass A.A., 2001).

Mr. Vice-Chancellor, Sir, along with other researchers, Akinboye, *et al.*, carried out an investigation on the importance of vegetation in malaria transmission. It was found that malaria transmission was higher in areas with residents of high socio-economic status: people residing in areas with vegetation, which included trees, vegetables, oranges, mangoes, flowers, etc, than in an environment without any vegetation, but with houses and apartments of people of low socio-economic status and low standards of life, with relatively dirty gutters and environments. The explanation was that hatching mosquitoes have a very suitable environment to hibernate and rest under the plants before seeking human to bite.

Malaria and Genetic Polymorphism of Haemoglobin Genotypes and ABO blood Groups. (Akinboye, D.O., Ovansa, J.U., Fawole, O., Agbolade, O.M., Akinboye, O.O., Amosun, A.M., Atulomah, N.O.S., Happi T.C., Oduola, O., Owodunni, B.M., Rebecca, S.N., Felade, M., and E. Okwong, 2009).

Working along with other researchers we examined 765 fibrile patients, who complained of malaria infection. These patients were clinically examined for malaria symptoms. Two hundred were clinically diagnosed for malaria infection. Blood films were prepared from these and examined for malaria parasites. Their Haemoglobin (Hb.), genotypes and ABO blood groups were determined. The patterns of malaria infection were determined among Hb. genotypes and ABO blood groups. One hundred and eighty had *P. falciparum* infection. Age group 1-5 years had the highest frequency of malaria infection, while ages 36-40 was least infected. The

differences within the mean parasite counts, among the age groups were significant. Males were more infected than the females. The mean parasite load of the males was also significantly higher than that of the females. The Hb genotype AA patients were found to be more infected than the genotype AS.

The Influence of Malaria on some Haematological Parameters in Pregnancy. (Akinboye, D.O., Okonofua, O., Awodele, O., Agbolade, O.M., Ayinde, O.O., Rebecca, S.N. and Haruna, Y. O., 2011).

Pregnant women and their unborn fetuses are usually at a high risk of deleterious attacks of malaria infection but standard chemotherapy and prophylaxis is lacking or inadequate in most endemic areas. The main objective of the research was to determine the number of febrile pregnant women who had malaria parasites, symptomatic or asymptomatic and also to investigate the influence of malaria parasites on some hematological parameters, in pregnancy. The investigation was conducted during the second trimester of pregnancy. Blood samples were examined and evaluated for malaria parasites. Some hematological parameters like packed cell volume (PCV), reticulocyte count, and total white blood cell counts (WBC) of each samples was determined. Seventy two percent were positive for *Plasmodium (P) falciparum* infection and parasite densities varied from 5.2-25%. The range of the PCVs among the febrile women was 18% (23 to 41%) while it was 8% (36 to 44%) in the non-febrile women. Reticulocyte counts of the febrile women had a range of 5.3% (1.0-6.3%) while the non-febrile ones (control) had 1.0% (0.5 -1.5). Reticulocyte counts were significantly higher in febrile women with high parasitaemia, while PCVs were significantly lower, in the same group of women. Those with high parasite counts had relatively higher, total white blood cell counts and lower PCVs, than others. There were associations between parasitaemia and PCVs, and also between parasitaemia and WBCs.

Factors Associated with the use of Insecticide –Treated Nets amongst Pregnant Women in Olorunda Local Government Area, Osun State, Nigeria. (Akinboye, D. O., Asekun-Olarinmoye, T.F., Olaore, Y. and Akintunde T.I., 2012).

Data was collected to investigate the above. The results highlighted the importance of providing adequate prophylaxis and chemotherapy for pregnant women. In another study, it was stated that in several parts of Nigeria including South-west, there were very low usage of Insecticide Treated Nets (ITNs) amongst pregnant women. The objective of the study, was to identify the factors influencing the use or lack of use, of insecticide-treated nets amongst pregnant women, between the ages of 15 and 49 years. Factors identified to be related to ITN use were age group, religion, educational status, knowledge of malaria preventive measures, amongst several others. Majority of the respondents had good knowledge of malaria transmission route and preventive measures, although the prevalence of use was still relatively low in the study area. It was therefore recommended that efforts should be intensified in providing more comprehensive health education at antenatal clinics, to advertise ITN distribution and also make it readily available as well as to individuals living in both the urban and rural areas.

There was a study on malaria (Akinboye *et al*, 2009), the distribution of haemoglobin genotypes, ABO blood groups and severity of malaria infections, among the various haemoglobin genotypes were determined.

Compilation of Febrile Illnesses and Correlation of Herbal Remedies for Treatment in Tivland. (Ajaiyeoba, E.O., Osowole, O.S., Ashidi, J.S. Akinboye, D.O., Bolaji, O.M., 2002).

compiled febrile illnesses (including malaria) and correlated this with herbal remedies for the treatment.

Cultural categorization of febrile illnesses in correlation with herbal remedies used for treatment in Southwestern Nigeria. (Ajaiyeoba, E.O., Fawole, O.I., Bolaji, O.M., Akinboye, D.O., Osowole, O.S., 2003).

A study was also conducted in South Western Nigeria. Both studies, showed that various herbal remedies were used for treating febrile illnesses. There was no specific interpretation of the word malaria. Febrile illnesses which could be symptoms of various diseases, were simply referred to as “iba”, which may not necessarily be malaria, in South-west Nigeria.

In another research titled, *Innovative collaboration among healthcare providers, for the control of childhood malaria, in a developing country*, which was presented at the Fifth MIM Pan-African Malaria Conference, held in Nairobi Kenya, (Akinboye *et al.*, 2009) effort was made to control malaria. Health care providers, patent medicine sellers and traditional healers usually treat childhood malaria in developing countries. Members of each group discriminate against the other groups. When complications arise during treatment, they do not disclose administered drugs or refer patients to orthodox healthcare facilities. These lead to death of children. The objectives of this study were to reduce infant mortality due to malaria among patients who do not respond to the treatment of patent medicine sellers/traditional healers and to establish referral procedures from both groups, to orthodox health care providers. This study was conducted in both rural and urban local government areas in Nigeria. Comprehensive four days educational programmes were separately conducted for each of the three target groups. Addressed were causes, transmission, symptoms and control of malaria and also the advantages of collaboration between the target groups, and the importance of referral information. Group members established collaborative links to prevent infant mortality due to malaria. They agreed to invite members from other groups to attend their periodical meetings and exchange information on malaria treatment. Post inauguration visits to study sites revealed adherence to terms of agreement.

Educating target groups about collaborative methods of saving the lives of children who did not respond to treatment of traditional healer or patent medicine sellers, was a remarkable innovation in the treatment of childhood malaria. It is recommended that such experimental studies be conducted in other developing countries, to advance the management and control of childhood malaria and other diseases.

Urinary Schistosomiasis: Water contact frequency and infectivity among secondary school students in Ibadan, Nigeria. (Akinboye, D.O., Ajisebutu, J.U., Fawole O., Agbolade, O.M., Akinboye, O.O., Amosu, A.M., Atulomah, N.O.S., Awodele, O., Oduola, O., Owoduni, B.M., Rebecca, S.N., Falade, M. and Emem, O., 2011).

Schistosomiasis is a chronic granulomatous disease caused by a group of digenetic trematode worms known as *Schistosomes*, (Jordan, 1986). The disease is also referred to as snail fever or bilharziasis and is believed that it was already known in Egypt and Mesopotamia as early as 1900 B.C., (Ansari, 1973). A research was carried out to investigate if some secondary school students whose schools were located near a stream, which was suspected to be infected, were well informed about the transmission of schistosomiasis, if the students were infected, and also to determine if snails in the stream were infected.

A total of 205 students were examined for the presence of *Schistosoma (S.) haematobium* ova. One school served as control because it was located very far away from the stream. Also, students from the other two schools were selected and examined for *Schistosome* ova because of the proximity and ready accessibility to the stream. Water-contact frequency and knowledge of

the cause of schistosomiasis among the students were investigated. Surroundings were examined for *Bulinus globosus*, the intermediate host of *S. haematobium*.

Snails found were examined for sporocysts. Water samples, from the stream were examined for miracidia and cercariae. There was no significant difference between the prevalence of urinary Schistosomiasis among male and female students in the two schools. Also, there was no significant difference between the prevalence among male and female students in both schools. The species of snails found in the stream were *Bulinus globosus*, *Lymnea natalensis* and *Lanistes lybicus*. Cercariae shedding occurred in only one of the *Bulinus globosus* snails. However, upon dissection, the presence of sporocysts confirmed infection in other *Bulinus globosus* snails. The presence of these confirmed that the stream was infected.

Please note that infection with this parasite leads to the presence of blood in urine and the infection is contracted by wading in an infected stream. Observing blood in urine does not need to be hidden because it does not mean that such a person has been having illicit affairs with an infected person and has therefore contracted the disease. If you observe blood in the urine of children, or even in an adult, please seek for treatment in Babcock University Teaching Hospital.



Fig. 18a: *Schistosoma haematobium* (adapted from the life tree)

In another research, I investigated if the adult worms of human *onchocercal volvulus*, which normally resides in palpable nodules, under the skin of humans, (who have been severally bitten by infected *Simulium damnosum*, a blood sucking insect), would survive in laboratory albino rats or not, (Akinboye 1990).



Fig. 18b: Boy with palpable nodule (Source: WHO/TDR/image 98031026)

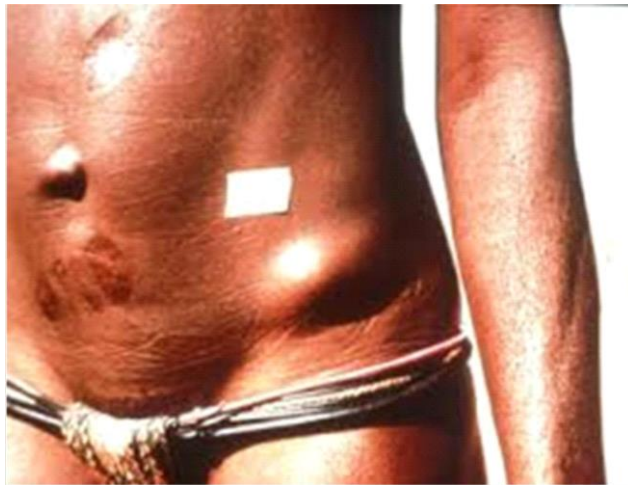


Fig. 19: A woman with palpable nodule
(Source: WHO/TDR/image)



Fig. 20: A man with palpable nodule (Source: WHO/TDR/image)

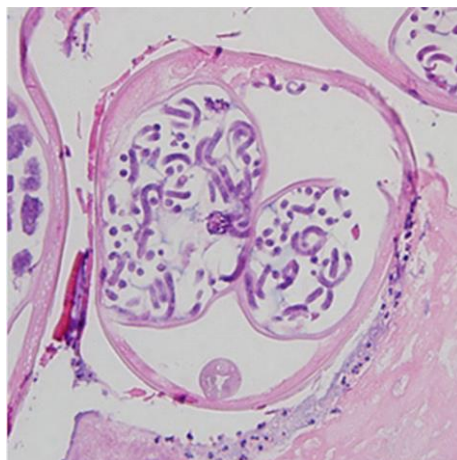


Fig . 21: Gravid female of *O. volvulus* in tissue, stained with a Hematoxyline (H.). Notice the presence of microfilariae in the uterine tubes.

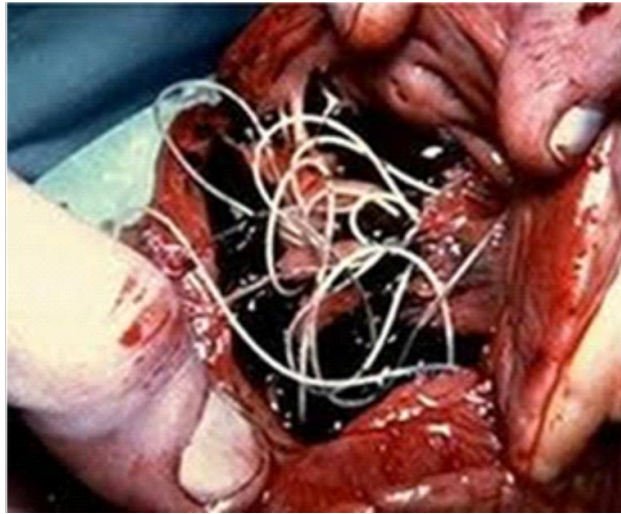


Fig. 22: Adult male and female *Onchocerca volvulus* in a partially dissected human nodule, (Source: WHO/TDR/image)

A parasite called *onchocerca volvulus*, aggregates within subdermal nodules which can be palpated. Diagnosis by palpating the nodules, however, is uncertain because nodules may be very small or located in deeper layers of the skin, etc. Diagnostic measures are difficult to derive and may depend on the age of the patients. Examination of skin snips may be diagnostic if found to be positive.

Studies on the Survival Pathology and Mechanism of Resistance in *Onchocerca Volvulus* and *Onchocerca armilata* Infections on Laboratory Rodents, (1990).

Nodules were surgically detached from infected people, residing in an endemic area and transplanted into the peritoneal cavities of albino rats. It was detected that the parasites survived and were still viable. Further attempt was made to investigate the Pathology and Mechanism of Resistance in *onchocerca volvulus* and *onchocerca armilata* infections in Laboratory Rodents, Akinboye (2001). It was detected that the adult parasites survived, formed nodules and also produced microfilaria. Histopathology examination of the nodules, (after sacrificing the experimental laboratory animals) revealed the presence of adult worms and microfilaria, (in sections stained with hematoxylin and eosin).

Onchocerciasis among Inhabitants of Ibarapa Local Government Community of Oyo State, Nigeria. (Akinboye, D. O., Okwong, E., Ajiteru N., Fawole, O., Agbolade, O. M., Ayinde, O. O., Amosun, A. M., Atulomah, N.O.S., Oduola O., Owodunni, B.M., Rebecca, S. N., Falade, M., 2010).

In another study on onchocerciasis, which was conducted among the inhabitants of a rural community in Ogun State, it was shown that 54% of the inhabitants were infected with onchocerciasis. Microfilaria count was higher among males than among females. The inhabitants aged 21 years and above were more infected than those between the ages of eleven and twenty years. Farmers were more infected than other categories of professions residing in the study area.

Experimental Culture of *Ascaris* Species and Histopathological Effects on Visceral Organs of Rats (*Rattus*) and Mice (Akinboye, D.O., Ovansa, J.U., Agbolade, O.M., Fawole, O., Akinboye, O.O., Amosun A.M., Atulomah N.O.S., Rebecca S.N. Okwong E. and Owodunni, 2009).

In another study, *Ascaris* ova was experimentally cultured in the laboratory, then implanted in albino rats and the developmental stages were observed. Histopathology examinations and the effects on visceral organs of the rats (*Rattus*) and mice (*Microtus*) were observed. The parasites survived and were found to have made some lesions while migrating to some part of the visceral organs.

***Loa loa* and *Mansonella Perstans* Infections in Ijebu North, Western Nigeria: A Parasitological Study, (Agbolade, O.M. and Akinboye, D.O., 2001).**

Prior to 2001, studies had not been conducted to determine the various types of filarial infections in the old Western Region, the researchers investigated the types that could be present in Ijebu North of the region. It was discovered that *Loa loa* and *Mansonella perstans* infections were present in the study area.

Detection of *Microfilaria* with Counting Chamber Technique in some Nigerian Rural Communities. (Agbolade, O.M. and Akinboye, D.O., 2003).

More investigations were conducted on methods of diagnosing filariasis. The traditional method was to make a blood smear on a slide and examine it under the microscope detected that instead of using a microscope slide, it was better to charge a counting chamber with whole blood, and examine it microscopically. The rapid movement of the microfilaria was readily detectable. This method was found to be more sensitive since the counting chamber would contain a higher volume of blood, than a smear on a slide.

Intestinal Helminthiasis and Urinary Scistosomiasis in some Villages of Ijebu North, Ogun State, Nigeria. (Agbolade, O.M., Akinboye, D.O., and Awolaja, A., 2004).

Furthermore, the researchers investigated the level of infectivity of intestinal helminthiasis and urinary schistosomiasis in some villages of Ijebu North. Infected participants benefited by being treated.

***Perstans* Filariasis: Clinical Symptoms and Some Hematological Parameters in Ijebu North Area of Ogun State, Nigeria., (Agbolade, O.M. and Akinboye, O., 2005).**

In another study, in the same study site, the researchers worked on *Perstans* filariasis and related the clinical symptoms to the diagnoses.

Biting of anthropophilic *Culicoides fulvithorax* (Diptera: Ceratopogonidae), A Vector of *Mansonella perstans* in Nigeria. (Agbolade, O.M., Akinboye, D. O., Olateju, T. M., Ayanbiyi, O. A., Kuloyo O.O. and Fenuga, O.O., 2006).

As earlier mentioned in this lecture that biting insects transmit many diseases, there is a very tiny/small type of insect that is anthropophilic. It is called *Culicoides fulvithorax*, (Diptera: Ceratopogonidae), and was found to be present in the study area in Nigeria and also to be transmitting a parasite called *Mansonella perstans*.

Identification of Parasites, Other Organisms, Chemical Contaminants and Sewage Disposal Systems in Domestic Water Sources, in an Urban Community of Ibadan, Oyo State, Nigeria. (Akinboye, D. O. and Balogun, O., 2012)

Various types of parasites, bacteria, viruses, and chemicals contaminate drinking water at various sources, through seepage of contaminated run-off water or within the piped distribution system, leading to health impairment. These are the reasons why many of those who have access to water supplies through pipe-borne processes, contract diseases which are among the most recent emerging and re-emerging infectious diseases throughout the world. The main objectives of this study were to identify pathogenic organisms in the domestic water samples, analyze chemical and pathogenic contaminants present and determine the types of sewage disposal systems in the study area. Pathogenic chemicals detected were Nitrite and Calcium. Pathogenic organisms present in various water samples were *Enterococcus faecalis*, *Escherichia coli*, *Vibrio alginolyticus*, *Vibrio parahaemolyticus*, *Pseudomonas aeruginosa*, *Streptococcus pyogenes*, and *Staphylococcus aureus*. Non-pathogenic ones were also found. The microorganisms and the chemical contaminants found in various water samples could result in different types of diseases. This is of Public Health importance, it is therefore recommended that periodic analyses and purification of domestic water should be carried out.

My contributions to University Communities

- (i) Former External Examiner, University of Ghana Medical School, Accra, Ghana.
- (ii) Former External Examiner, Lagos State University, Nigeria.
- (iii) Current External Examiner, Olabisi Onabanjo University.
- (iv) Assessment of Lecturers for promotion, to Professorial grades, in various Universities.

My contributions to Babcock University

I have contributed to the development of Babcock University by serving in the following positions and committees:

- 1. Inaugural Planning Committee, 2014 to date.
- 2. Chairman, Students' disciplinary Committee, 2015 to date.
- 3. Curriculum Committee, 2009 to 2015.
- 4. Colloquium Program and Secretariat Committee, 2012 to date.
- 5. Ways and Means Committee (WAMCOM), 2011 to 2015.
- 6. Postgraduate School Board Committee, 2010 to 2015.
- 7. E-learning Board Committee, 2013 to date.
- 8. Dean School of Public & Allied Health, 2011 to 2015.
- 9. Chairman of Research Committee, School of Science and Technology, 2008 to 2010.
- 10. Chairman Babcock University Health Research Ethics Committee, 2013 to date.
- 11. Academic gown Design Committee 2010 to date.
- 12. Chairman, School of Public & Allied Health Board, 2011 to 2015.
- 13. Member Academic Standard Board, 2009 to 2015.
- 14. Instructional material committee, 2010 to date.
- 15. Member Babcock University Staff Housing Committee, 2011 to 2015.
- 16. Head, Department Public Health, 2009 to 2011.

17. Sponsor of 2013, Jacinth, graduating students, who constructed the car park between the School of Computing and Engineering Sciences and Babcock Business School.
18. I have also presided over Senate Proceedings, (at the invitation of the sitting Chairman). The design and production of the maiden issue of the Journal of Public and Allied Health Sciences, (in the School of Public and Allied Health) was done, when I was in office as Dean through the grace of God. I therefore acknowledge the financial contribution of Babcock University administration to enhance and encourage scholarship in the University.

Recommendations

It is best to prevent and control parasite infections. Eradication is possible but may not always be easy. The solutions to the major challenges are recommended as follows:

- (1) Learn as much as possible about parasite and their vectors. Obtain information about their transmission, where they breed, live and where they like to feed and what repels them.
- (2) As much as possible, prevent parasite and their vector from breeding. Disease transmitted by vectors can easily be prevented if the vectors are not allowed to breed.
- (3) Programmes should be put in place to prevent stagnation of water, by filling hole with sand and making provision for good drainages, thereby preventing breeding sites of some vectors, (e.g., mosquitoes).
- (4) Routine removal and collection of garbage should be encouraged, thereby preventing flies from breeding in the environment.
- (5) In cases where total elimination of vectors may not be possible, the immature stages should be targeted before reaching maturity.
- (6) Larvicides should be adopted to eliminate the larval stages of vectors, in order to control vectors by preventing the development, (*Glossina* and other vectors can also be controlled by destroying the breeding sites).
- (7) Control/eliminate the vectors to prevent disease transmission: in many circumstances particularly during an epidemic, the most suitable control measure is to target adult vectors, to reduce or prevent transmission. Use of chemical control method, including space spraying should be adopted.
- (8) Self-care and self-protection are recommended. The following should be included: The use of chemoprophylaxis, wearing of long sleeves and socks to reduce opportunities for mosquitoes and other vectors to bite and the use of insecticide treated bed nets while sleeping. Rubber gloves and boots should also be used if working in an area that may have been contaminated.

In summary, each of the control measures described above and as earlier mentioned should be considered in the design of any programme which intends to control a vector-borne disease. In some instances, treatment of cases is also considered as a preventive measure. Treatment of people infected with parasitic infections involves removal and elimination of reservoirs of infection, preventing the transmission of the disease, from one human being to another or from

one host to another. From all the points raised, it is evident that eradication of parasitic infection is more complex and more difficult to achieve than control, but if all the points identified in this lecture are addressed, the challenges posed, can be overcome.

Acknowledgments

I thank the Creator per excellence, the Almighty God, the Immortal, Invisible, the only wise God, the author and finisher of my Faith: for making this day a reality. I thank my God and my redeemer, for giving me the opportunity to see this special day in my life! He is the repository of knowledge, the actualization of truth, the Lord, my God is the chief Parasitologist!

I must remember my supervisor at the University of Ibadan, Prof. 'Delani Ogunrinade, who is now late, he was a committed and dedicated Professor, who supervised my Ph.D Thesis, with painstaking thoroughness. At this point, I want to mention that I was older than my supervisor but all the same, when addressing him, or talking to him, I would still say, "Yes sir, Yes sir or excuse me sir". He would tell me, "You must study hard and develop to be a scholar" and I would say "thank you sir".

In those days when I was in school, I could never dream or imagine that I would be a Professor: all glory be to God! Likewise, I appreciate the contributions of Prof. Ogunba, also of blessed memory. Although they are both not here, I am one of their products and the work of their hands is still alive today. My supervisors passed on the academic baton to me and I have also passed it on to others, some of whom are here today. We have worked together and conducted many researches together. We are now colleagues. I therefore thank them for not letting me down. These are Dr. Agbolade M., Dr. Rebecca-Naphtali Livingstone, Dr. Falade M., Dr. Kio. C. and Prof. Happi C., the current Dean of Post Graduate School in Redeemers University,

I must remember the members of my research team, at my former University, the University of Ibadan and the University College Hospital (UCH), where I previously worked. The team was named, "The Malaria Research Team". Together we laboured, worked hard, conducted many researches, which we showcased all over the world and published in renowned journals. I am most grateful to the leader of the research team, Prof. A.M.J. Oduola, who was a great researcher that put the multidisciplinary research team together. Other members were, Prof. Sowunmi A., Prof. Oladepo O., Prof. J. D. Adeniyi, Prof. Ajaiyeoba E., Prof. Gbotosho G.O., Prof. Falade C.O., and Dr. Fawole O., including Dr. Ogundahunsi, O.A.T, Dr. Ajayi I., Dr. Osowole O.S., and Dr. Bolaji, O.M. I appreciate the contributions of all the members and I will always remember all of them.

I remember the research team of the School of Science and Technology (SAT) which was "put together" by Prof. Grace Tayo, when she was the Dean of SAT. I was the chairman of the team and Prof. Oludele Awodele was the secretary. Many researches were conducted and SAT, showcased and won many competitions for Babcock University, during the period. I am very grateful to all the members of SAT Research Team.

I appreciate the dynamic contributions of the members of another multidisciplinary research team, based at Babcock University and BUTH, of which I am still the chairman, comprising of

Prof. Abdullah A.R., Prof. Awodele O., Dr. Effedua H. I., Dr. Bamidele E., and Mrs. Akintunde T. I., who was the dynamic Secretary to the research team.

I thank Prof. Grace Tayo and other members of Babcock University Health Research Ethics Committee, of which I am currently the Chairman. I highly appreciate and admire the willingness, thoroughness, speed and methodology of their operations. They have all been very supportive. May God continue to strengthen all the members, amen.

I thank the inaugural planning committee members, comprising of Emeritus Prof. M. Omolewa, Professors Akinsoyinu A.A., Onajobi F.D., Alegbeleye G.O., Tayo G.O., and Dr. Kola Ayodele., for their useful contributions and suggestions towards this preparation and the improvement of this lecture. I am also a member of the inaugural planning committee.

I appreciate the contributions and cooperation of my current Dean, Prof NOS Atulomah, the Heads of Departments who worked with me when I was the Dean, Prof. GND Aja and Prof J. C. Ihangbe. I must remember to thank my current Head of Department, Associate Professor Olanrewaju, M. I also thank all the faculty and staff of the School of Public and Allied Health because I appreciate their contributions, cooperation and support when I was the dean. May God bless all of them, amen.

As I remember my siblings, how we grew up together, I also remember the adage which says “20 children can not play together for 20 years”, also “20 adults, cannot play together for 20 years”. (Akinboye, 2015)! My siblings are in various parts of the world, in Britain, US and Nigeria. That notwithstanding, I always remember them, they are Chief Adebayo Babalola, Akinade, Olayinka and Olutunde Babalola. I appreciate all of them.

My immediate family is a very wonderful one. My husband has seen me through thick and thin, especially when I was reading. He would teach me academic things which I didn't know. He stood closely by me and supported me. He also took care of our children when they were very young and I had to attend lectures; in fact, till today, I cannot beat him in child care because everything I could do for our children, including cooking, he could also do, well, except breastfeeding! He supported me to achieve in all spheres of life. The long and short of it all is that he is very caring, for me first, for our children, my relatives and all. I am very grateful indeed, “thank you”. God gave us three wonderful children, all of who are here today; the first is Dr. Olubunmi Ayinde, followed by Olusola and Olufunso Akinboye, both of who are PhD students. We are blessed with one loving, caring, beautiful and tender-hearted granddaughter, Ebunoluwa Ayinde, merely looking at her makes me very happy. I thank God and glorify His name for giving me such a wonderful family! I appreciate their care and thank them for their love.

My friends of over thirty years can never be forgotten and I thank God for sparing their lives. Right on my heart are Dr. Janet Ola and Mrs. Taiwo Ogundairo who are here now. I appreciate their friendship and I thank them. My other friends who are not here are Dr. Fawole O., Mrs. D. Anifowose, Mrs. Y. Oladini, Mrs. Sola Odunsi, Prof. Ajaiyeoba E., and others. I thank Senator Professor Sola Adeyeye for coming all the way from Abuja, to grace this occasion.

I thank my church Pastor, B.B. Aina, for his constant prayers. The prayer and the presence of my church representatives, Elder Engr. Idowu Sogelola, the families of Elder Kayode Ojo, Barrister Dele Abolarin and Akinlolu Fakeye, are also very much appreciated. The presence of representatives of one of my academic societies, which is Parasitology and Public Health Society of Nigeria, is appreciated. I thank the childhood friend of my husband, Alhaji Lasun Ajao, for

finding time to come. The contributions of Mrs. Mega Sobrowe Egberedu and Mrs. Kemi Olosunde towards the production of this manuscript, are highly appreciated.

I appreciate all the members of Administration and all other Vice Presidents and Associates, for their constant support. I also thank the University Registrar, Dr. Jonathan Nwosu.

I am grateful to the Senior Vice President/Deputy Vice Chancellor, Prof. Iheanyichukwu Okoro, who was my supervisor for four years, when I was Dean. He has listening ears and he makes efforts to solve all problems brought before him by using various methods, which most of the time, included proverbs. One will wonder how he copes with all his duties, but obviously it is because he has the constant support of Prof. Clara Okoro. I thank you both.

I heartily thank the President and Vice-Chancellor of this great institution, Prof. James Kayode Makinde, for his exemplary leadership of this institution. He is a brave man, well disciplined, youthful and intelligent; just to mention a few of his scarce and eminent attributes. He is supported by his beautiful wife Prof. Yetunde Makinde, who is a blessing to the president and to this great institution of learning. The president leads by example, in the way he talks, comports himself, the way he dresses and the way he untwines tight-roped situations. Through the grace of God, and through his administration, he made me to achieve my most important aspirations, ambitions and desires in academics and in life. May God continue to bless him and his wife abundantly, amen. Mr. President Sir, I doff my hat.

It is a pleasure for me to see everyone here, from various fields of learning, the sciences, social sciences, arts, humanities etc., coming together in the quest for knowledge. Knowledge is a unifying force that brings people of various races and disciplines together. One of the key principles of Babcock University is knowledge. Knowledge is so important that it is included in the logo of this great institution of learning (Fig. 23) therefore it is learning that has brought all of us together here today.

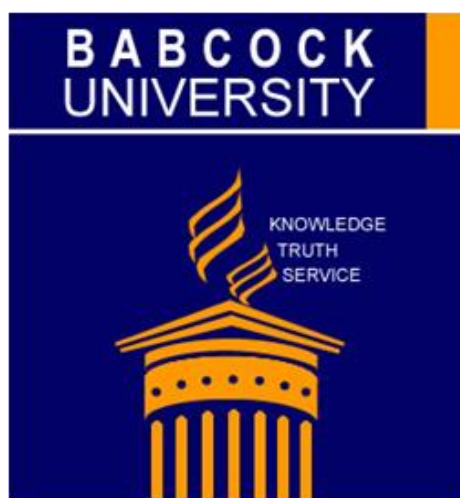


Fig. 23: Babcock University Logo

I appreciate the presence of everybody here, including Deans, Heads of Departments, Faculty, staff, students and all our friends from far and near including the ladies and gentlemen of the Press. Let us all keep the flag of Babcock University flying! Thank you all.

Conclusion

We have received foreign sponsorships and grants for so many years and therefore, we need to contribute and be part of the solution to the challenges of control and eradication of parasites in Public Health. Despite all efforts, parasites continue to be a very important and unacceptable burden to us, especially among the poor, neglected and underdeveloped societies, in countries like Nigeria. The existence of poor people, poor health facilities and poverty, provide opportunities for parasitic diseases to continue to thrive. These have been found to be a major impediment to development. After listening to me for so long, it should be clear that control of parasites, elimination or even the eradication and intervention, depend on every one of us! We can no more claim to be ignorant of any of the information I have already given. We should not wait for the government to put up control programmes for us. Let us all work hard to face the challenges of control and eradication of parasitic infections, which is very vital in public health.

In the Bible, the apostle Paul clarified that “the whole creation groans and labors” because of the entry of sin into the world (Romans 8:22). In this wailing world, parasites are ugly factors which remind us of “the law of sin and death”, (Romans 8:2) which now rules the world. As we should know, death is God’s adversary, as it started with Adam. However, please don’t be discouraged because the saving work of Christ on the Cross has condemned death, and some day “there shall be no more curse” (Revelation 22:3). In essence, Mr. Vice-Chancellor Sir, there shall be no more sickness, no more parasites and no more death! May God eliminate all the parasites in our lives, Amen.

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Previous Inaugural Lectures

1. “Seventh-day Adventist Church in Nigeria since 1914: An Impact Analysis.”
Lecturer: Prof. David. O. Babalola
Date: Thursday 2nd Dec., 2010.
2. “The Truth about Truth: Postmodernism and Its Epistemological Implications for Christian Education”.
Lecturer: Prof. Ademola S. Tayo.
Date: Thursday 5th Feb., 2015.
3. “Food for Thought in Thought for Food: Conceptual Genius of Local Ingredients in Global Diets and Food Habits of African Population.”
Lecturer: Prof. Yetunde Olawumi Makinde
Date: Thursday 2nd April, 2015.
4. “One Kingdom, Many Kings: The Fungi-once Side-lined and Maligned, now Irrepressible and Irresistible.”
Lecturer: Prof. S. Dele Fapohunda
Date: Thursday 2nd May, 2015.
5. “The Hand that Handles the Scalpel.”
Lecturer: Prof. Iheanyichukwu Okoro
Date: Wednesday 10th June, 2105.