**A**

**TECHNICAL REPORT**

**ON**

**STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)**

**UNDERTAKEN AT**

**NATIONAL INSTITUTE FOR PHARMACEUTICAL RESEARCH AND DEVELOPMENT (NIPRD),**

**P.M.B 21, IDU OLD GARKI, ABUJA**

**BY**

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**COLLEGE OF MEDICINE AND HEALTH SCIENCES**

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**DEDICATION**

This report is dedicated foremost to God Almighty for his favour, unlimited grace, consistent love, immeasurable faithfulness and for sparing my life throughout my SIWES programme at NIPRD Abuja.

My special gratitude goes to my parents, uncle and siblings for their love and support and everyone else that contributed towards making my SIWES training a fun and successful one.

**ACKNOWLEDGEMENTS**

My profound gratitude goes to God for his guidance, protection and grace on me for having successfully completed this program, it has been God for me and it will continue to be God, and also to the Industrial Training Fund for their foresight in putting this program in place and also to the Pharmacy unit NIPRD Abuja for providing a platform on which I was engaged on the training.

Also, I wish to express my sincere appreciation to my Professionally trained supervisor Pharmacist (Pharm. Adegoke Valentine) and other pharmacists I was assigned to (Pharm. Chioma, Pharm. Nembam, Pharm. Ade) and my Supervisor from school, Pastor Oni James Olukayode for their assistance given to me during my industrial training.

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**ABSTRACT**

The Student Industrial Work Experience Scheme established by the Federal Government of Nigeria was aimed at exposing students of higher institutions to acquire industrial skill and practical experience in their approved courses of study and also to prepare the students for the industrial work situation which they are likely to meet after graduation. This technical report is based on the experiences gained during my three months of industrial training at NIPRD. This report highlight the drugs given to HIV patients, and it also describe the activities and my experience gained during the period of the training.

**CHAPTER ONE**

**INTRODUCTION**

SIWES is an acronym for Student’s Industrial Work Experience Scheme. SIWES was established in the year 1973 in order to improve the standard of education in Nigeria in order to achieve the needed technological advancement. Economists being able to evaluate the role technology plays in a country’s economy concluded that for an economy to grow and develop there be advancement in the technology sector of the country. SIWES was solely funded by ITF (Industrial Training Funds) during it early stage not until it was difficult to continue for economic stress, then the responsibility was shared between Industrial Training Funds (ITF) and the Federal Government.
The Federal Government took over the funding of the scheme and Industrial Training Funds took over the managerial position by managing the funds given to them by the Federal Government in order to sustain the scheme.
SIWES (Student’s Industrial Work Experience Scheme) is a scheme for the duration of sixteen weeks (4 month). SIWES is done after the first year in polytechnics (ND1); and done after Second year or third year in Universities depending on the institutions. The effective management of Student’s Industrial Work Experience Scheme (SIWES) has been as a result of the cooperation and well played roles of the Federal Government, ITF, Supervising agencies. Here are the roles played by the managements of this scheme;

**ROLES OF THE FEDERAL GOVERNMENT**

Federal Government being the major party in the establishment off SIWES; has ever since been involved in the management of SIWES. Some of the roles played are:

* To make it mandatory for all ministries, companies and parastatals to offer places of attachment for students in accordance with the provision decree of No 47 of 1971 as amended in 1990.
* To provide necessary and adequate funds to ITF through the Federal ministries of industries.

**ROLES OF ITF (INDUSTRIAL TRAINING FUND)**

* Provide logistics and materials needed to administer the scheme**.**
* Supervise students through it Area offices.

**AIMS AND OBJECTIVES OF SIWES**

* To expose students to work methods and technique.
* To provide an avenue for students to acquire industrial skill.
* Enhancing students’ contacts with potential employers while on training
* To help students appreciate the role their professions play in the society.

As a student studying under the mandated department, I applied to NIPRD, a parastatal under the Federal Ministry of Science and Technology, with the sole of developing drugs, biological products, and pharmaceutical raw materials. This brief assay is therefore a report of the experience I had for (3) months at NIPRD Abuja, where I did my industrial training.

**CHAPTER TWO**

NIPRD is an essential part of Nigeria’s health system.  Established as a parastatal under the Federal Ministry of Science and Technology in 1987 and transferred to the Federal Ministry of Health in 2001, NIPRD’s primary objective is developing drugs, biological products, and pharmaceutical raw materials. This mandate also includes conducting quality-assurance tests as part of its research mandate for locally-manufactured medicines, as well as developing specifications for the production of such commodities. The National Institute for Pharmaceutical Research and Development is a government agency charged with the responsibility of applying appropriate modern science and technological resources to stimulate local production of drugs through effective collaboration with the industry and experts within and outside Nigeria, develop herbal and phyto-medicines and provide safety data and necessary information on herbal and others towards achieving self-sufficiency in the production and control of important drugs in such a way that would ensure the overall health of Nigerians and mankind in general amongst others.

NIPRD was designated a Centre of Excellence (CoE) in the African Sub-region in research and development of drugs, vaccines, phyto-medicines, and diagnostics towards improving the health and well-being of Nigerians and mankind by the African Network for Drugs and Diagnostics Innovation (ANDi) in 2011. NIPRD is ISO 9001:2015 certified by the Standards Organization of Nigeria, and recently got its laboratory accredited by the ANSI-ASQ National Accreditation Board (ANAB) for ISO 17025:2017 in the field of technical competence in testing. The institute is located at P.M.B 21, Idu Old Garki , Abuja which lies at the North central part of the country.

The institute comprises of several technical departments which furthermore has different subdivisions/ units

* Dept. of Microbiology & Biotechnology

The department is presently involved in antimicrobial resistance studies (AMR) which include testing natural products against multiple drug-resistant organisms

* Dept. of Medicinal Chemistry & Quality Control

The department is vested with the responsibility of the development of new or improved quality control methods, quality standards and specifications for the production and use in the manufacture of pharmaceutical products.

* Dept. of Medicinal Plant Research & Traditional Medicine

MPR&TM has the core mission to identify, collect, process, conserve and standardize medicinal plants and herbal medicines.

* Dept. of Pharmacology & Toxicology

This department is made up of four (4) Units, namely Pharmacology, Toxicology, Laboratory that manages the in vivo and in vitro, and Animal Facility Centre (AFC).

* Dept. of Pharmaceutical Technology & Raw Materials Development

PT&RMD is currently involved in the development of excipients (micro & nano- crystalline cellulose and chitosan) from local sources (coconut husk and snail shell respectively), modification of starches from local sources, development oral and topical formulations from herbal extracts.

**CHAPTER THREE**

**SUMMARY OF MY TRAINING EXPERIENCE**

I started my Industrial training experience on the 27th of May, 2019. I was posted to the department of pharmacy which falls as a subunit under the clinical department, where I served for 3 months. I was supervised by a professionally trained pharmacist (Pharm. Adegoke Valentine) who was the Head of the pharmacy unit. I was also assigned to various co-pharmacists (Pharm. Nembam, Pharm. Chioma and Pharm. Ade) who also assisted me in obtaining the necessary information required for the training. Under the 3 months training, I partook in subsequent seminars and classes. While serving, I was exposed to Antiretroviral drugs, Antimalarial drugs (e.g Amatem, coatem, lonart), Antibiotics drugs (e.g clarithromycin, cotrimoxazole, erythromycin, cetriaxone), Antituberculosis drugs (e.g Isoniazid), NSAIDs (e.g Ibuprofen, paracetamol, piroxicam), Antidiabetes (e.g Glibenclamide), Antihypertensive drugs (Amlodipine, Nifedipine). I also dispensed some drugs which I had knowledge of, and also based on the patient’s prescription from the doctor with the dosage written. At the end of every week, I recorded the drugs sold for the week inside a record book with the aid of the receipts being collected. This book had various rows and columns for recording consisting of the receipt number, date of payment, name(s) of drug(s) with quantities and cost of the drug(s). Also at the end of every 2 weeks, I took stock keeping on the quantity of drugs available in the store room so as to know the drugs which are still available and low in stock.

I also worked at the Antiretroviral therapy (ART)clinic which is also under the pharmacy unit, which I was thought how to dispense antiretroviral drugs via the OpenMRS (Open medical record system) and I assisted in dispensing the drugs to HIV patients based on their line of treatment considering their CD4 count and Viral loads and they were counselled.

Open Medical Record System (OpenMRS) is an efficient electronic medical record (EMR) storage and retrieval systems for treating the millions of HIV/AIDS and tuberculosis (TB) patients in the developing world.

I dispensed the drugs via the OpenMRS by;

* Firstly, before the patients comes to the ART clinic they take their assigned cards to the virology lab where their viral loads and other vital information will be taken.
* The patient proceeds to see the doctor afterwards for treatment in which the doctor prescribes his/her treatment in accordance to severity of the virus and other factors such as age, pregnancy etc. and sends it via web to the ARV pharmacy unit. The patient then proceeds to the ARV clinic with their custom assigned cards held in their hands for dispensation of drugs.
* At the ARV clinic, their card numbers will be input into the system via the OpenMRS to access the doctor’s prescription.
* The prescription entails the drug to be dispensed, the dosage and quantity of the drug.

For pregnants women, Nevirapen suspension was added to their prescription based on their status to prevent the child from getting infected and they were also counselled on how to give the child the suspension based on their baby’s weight.

Antiretroviral drugs given are combined with cotrimoxazole (under the brand name septrin) and Isoniazid (INH) because, due to their weak immune system they are prone to infections and diseases (such as tuberculosis mostly) and also serves as a prophylaxis by helping to prevent opportunistic infections. Tabs folic acid (vitamin B9) were also given to the HIV patients in combination with Isoniazid which serves as a prophylaxis that helps to prevent Isoniazid side effects. The patients were also advised on how to take the drugs and also not to take the drugs together due to drug interaction. But not all the patients were given septrin due to them reacting to it.

 ANTIRETROVIRAL DRUGS

Antiretroviral drugs are medications for the treatment of infection by retroviruses, primarily HIV. Different classes of antiretroviral drugs act at different stages of the HIV life cycle. Combination of several (typically three or four) antiretroviral drugs is known as Highly Active Anti-Retroviral Therapy (HAART).

There are six classes of Antiretroviral drugs

Each class of drug attacks HIV in a different way. Generally, drugs from two (or sometimes three) classes are combined to ensure a powerful attack on HIV. Most people start HIV treatment on two drugs from the nucleoside/nucleotide reverse transcriptase inhibitors class combined with either one integrase inhibitor, one non-nucleoside reverse transcriptase inhibitor, or one protease inhibitor – hence, ‘triple therapy’.

1. Nucleoside/Nucleotide reverse transcriptase inhibitors (NRTIs)

Nucleoside reverse transcriptase inhibitors (NRTIs), and nucleotide reverse transcriptase inhibitors (NtRTIs), often all referred to as NRTIs, work by targeting the action of an HIV protein called reverse transcriptase. After the HIV virus releases its genetic material into a host cell, reverse transcriptase converts the viral RNA into DNA, a process known as ‘reverse transcription’. NRTIs disrupt the construction of a new piece of proviral DNA, thereby stopping the reverse transcription process and halting HIV replication. This class of medications is sometimes referred to as the ‘backbone’ of a first-line HIV treatment combination. It includes the following drugs:

1. [Abacavir](http://www.aidsmap.com/Abacavir/page/3178812/)is marketed under the name Ziagen, but generic versions are also available. Abacavir is included in the combination tablets [abacavir/lamivudine](http://www.aidsmap.com/Kivexa/page/3122253/)and [Triumeq](http://www.aidsmap.com/Triumeq/page/3122277/).
2. [Emtricitabine](http://www.aidsmap.com/Emtricitabine/page/3178831/) is also known as Emtriva. It is included in the combination tablets [emtricitabine/tenofovir disoproxil](http://www.aidsmap.com/Truvada/page/3179167/), [Descovy](http://www.aidsmap.com/Descovy/page/3122229/), [Atripla](http://www.aidsmap.com/Atripla/page/3121485/), [Biktarvy](http://www.aidsmap.com/Biktarvy/page/3460848/), [Eviplera](http://www.aidsmap.com/Eviplera/page/3122237/), [Genvoya](http://www.aidsmap.com/Genvoya/page/3122245/), [Odefsey](http://www.aidsmap.com/Odefsey/page/3197188/), [Stribild](http://www.aidsmap.com/Stribild/page/3122269/) and [Symtuza](http://www.aidsmap.com/Symtuza/page/3197213/).
3. [Lamivudine](http://www.aidsmap.com/Lamivudine/page/3178839/) is marketed under the name Epivir, but generic versions are also available. Lamivudine is included in the combination tablets [abacavir/lamivudine](http://www.aidsmap.com/Kivexa/page/3122253/), [lamivudine/zidovudine](http://www.aidsmap.com/Lamivudinezidovudine/page/3195346/), [Triumeq](http://www.aidsmap.com/Triumeq/page/3122277/), [Delstrigo](http://www.aidsmap.com/Delstrigo/page/3460837/) and Dovato.
4. [Tenofovir disoproxil](http://www.aidsmap.com/Tenofovir/page/3178848/) is marketed under the name Viread, but generic versions are also available. Tenofovir disoproxil is included in the combination tablets [emtricitabine/tenofovir disoproxil](http://www.aidsmap.com/Truvada/page/3179167/), [efavirenz/emtricitabine/tenofovir disoproxil](http://www.aidsmap.com/Atripla/page/3121485/), [Delstrigo](http://www.aidsmap.com/Delstrigo/page/3460837/), [Eviplera](http://www.aidsmap.com/Eviplera/page/3122237/) and [Stribild](http://www.aidsmap.com/Stribild/page/3122269/).
5. [Tenofovir alafenamide](http://www.aidsmap.com/Tenofovir/page/3178848/), a newer formulation of tenofovir, is available in the combinatiotablets [Biktarvy](http://www.aidsmap.com/Biktarvy/page/3460848/), [Descovy](http://www.aidsmap.com/Descovy/page/3122229/), [Genvoya](http://www.aidsmap.com/Genvoya/page/3122245/), [Odefsey](http://www.aidsmap.com/Odefsey/page/3197188/) and [Symtuza](http://www.aidsmap.com/Symtuza/page/3197213/)
6. [Zidovudine](http://www.aidsmap.com/Zidovudine/page/3179175/) is marketed under the name Retrovir, but generic versions are also available. Zidovudine is included in the combination tablet [lamivudine/zidovudine](http://www.aidsmap.com/Lamivudinezidovudine/page/3195346/).
7. Non-nucleoside reverse transcriptase inhibitors

Non-nucleoside reverse transcriptase inhibitors (NNRTIs) also target reverse transcriptase, but in a different way to NRTIs. NNRTIs interfere with the reverse transcriptase enzyme by binding directly to it, blocking the reverse transcription process. It includes the following drugs

1. [Doravirine](http://www.aidsmap.com/Doravirine/page/3460827/) is also known as Pifeltro. Doravirine is included in the combination tablet [Delstrigo](http://www.aidsmap.com/Delstrigo/page/3460837/).
2. [Efavirenz](http://www.aidsmap.com/Efavirenz/page/3196844/) may be marketed under the name Sustiva, but generic versions are also available. Efavirenz is included in the combination tablet [efavirenz/emtricitabine/tenofovir disoproxil.](http://www.aidsmap.com/Atripla/page/3121485/)
3. [Etravirine](http://www.aidsmap.com/Etravirine/page/3197135/) is also known as Intelence.
4. [Nevirapine](http://www.aidsmap.com/Nevirapine/page/3193407/) may be marketed under the name Viramune, but generic versions are also available.
5. [Rilpivirine](http://www.aidsmap.com/Rilpivirine/page/3197205/) is also known as Edurant. Rilpivirine is also available in the combination tablets [Odefsey](http://www.aidsmap.com/Odefsey/page/3197188/), [Eviplera](http://www.aidsmap.com/Eviplera/page/3122237/) and [Juluca](http://www.aidsmap.com/Juluca/page/3460864/).
6. Integrase inhibitors

Integrase inhibitors target a protein in HIV called integrase which is essential for viral replication. Integrase is responsible for inserting viral genomic DNA into the host chromosome. The integrase enzyme binds to host cell DNA, prepares an area on the viral DNA for integration, and then transfers this processed strand into the host cell’s genome. Integrase inhibitors stop the virus from inserting itself into the DNA of human cells.

1. Bictegravir is only available in the combination tablet [Biktarvy](http://www.aidsmap.com/Biktarvy/page/3460848/).
2. [Dolutegravir](http://www.aidsmap.com/Dolutegravir/page/3178823/) is also known as Tivicay. It is included in the combination tablets [Juluca](http://www.aidsmap.com/Juluca/page/3460864/) and [Triumeq](http://www.aidsmap.com/Triumeq/page/3122277/), and Dovato.
3. Elvitegravir is only available in the combination tablets [Genvoya](http://www.aidsmap.com/Genvoya/page/3122245/) and [Stribild](http://www.aidsmap.com/Stribild/page/3122269/).
4. [Raltegravir](http://www.aidsmap.com/Raltegravir/page/3197197/) is also known as Isenstress.
5. Entry inhibitors

Entry inhibitors stop HIV from entering human cells. There are two types: CCR5 inhibitors and fusion inhibitors. In order to enter a host cell, HIV must bind to two separate receptors on the cell’s surface: the CD4 receptor and a co-receptor (CCR5 or CXCR4). Once HIV has attached to both, its envelope can fuse with the host cell membrane and release viral components into the cell. CCR5 inhibitors prevent HIV from using the CCR5 co-receptor by binding to it, blocking viral entry. CCR5 inhibitors doesn’t work in everyone and are very rarely used for first-line treatment. You would have a test to see if this type of treatment would be effective before starting on it.

[Maraviroc](http://www.aidsmap.com/Maraviroc/page/3197162/) is also known as *Celsentri.* (An example of CCR5 antagonist).

1. Fusion inhibitors

 Unlike NRTIs, NNRTIs, PIs, and INSTIs, which works on infected cells these drugs helps to block HIV from getting inside healthy cells. Examples include: Enfuvirtide, or ENF or T-20 (Fuzeon). It works by stopping the fusion of the HIV envelope protein with the CD4 cell.

1. Protease inhibitors (PIs)

Protease inhibitors (PIs) block the activity of the protease enzyme, which HIV uses to break up large polyproteins into the smaller pieces required for assembly of new viral particles. While HIV can still replicate in the presence of protease inhibitors, the resulting virions are immature and unable to infect new cells.

1. [Atazanavir](http://www.aidsmap.com/Atazanavir/page/3195329/) may be marketed under the name Reyataz, but generic versions are also available. Atazanavir is included in the combination tablet [Evotaz](http://www.aidsmap.com/Evotaz/page/3197143/).
2. [Darunavir](http://www.aidsmap.com/Darunavir/page/3195338/) may be marketed under the name Prezista, but generic versions are also available. Darunavir is included in the combination tablets [Rezolsta](http://www.aidsmap.com/Rezolsta/page/3122261/) and [Symtuza](http://www.aidsmap.com/Symtuza/page/3197213/).
3. Lopinavir is only available in the combination tablet [Kaletra](http://www.aidsmap.com/Kaletra/page/3193419/).

Booster drugs

Booster drugs are used to ‘boost’ the effects of protease inhibitors. Adding a small dose of a booster drug to an antiretroviral makes the liver break down the primary drug more slowly, which means that it stays in the body for longer times or at higher levels. Without the boosting agent, the prescribed dose of the primary drug would be ineffective.

1. [Ritonavir](http://www.aidsmap.com/about-hiv/arv-factsheet/ritonavir)is also known as Norvir. Ritonavir is included in the combination tablet [Kaletra.](http://www.aidsmap.com/Kaletra/page/3193419/)
2. [Cobicistat](http://www.aidsmap.com/about-hiv/arv-factsheet/cobicistat)is also known as Tybost. Cobicistat is included in the combination tablets [Evotaz](http://www.aidsmap.com/Evotaz/page/3197143/), [Genvoya](http://www.aidsmap.com/Genvoya/page/3122245/), [Rezolsta](http://www.aidsmap.com/Rezolsta/page/3122261/), [Stribild](http://www.aidsmap.com/Stribild/page/3122269/) and [Symtuza](http://www.aidsmap.com/Symtuza/page/3197213/).

**CHAPTER FOUR**

**CONCLUSION AND RECOMMENDATIONS**

CONCLUSION

The student industrial work experience scheme is indeed a great avenue for students to develop skills needed in the society whether they are to become entrepreneurs or employees. Engaging in this program has really exposed me to the work environment I will likely meet upon graduation. It has also given me the opportunity to apply the knowledge gained from school and also improve on it and it also expanded my knowledge on some medical fields.

RECOMMENDATIONS

Considering the benefits of engaging in the SIWES, I recommend an active participation in this exercise by all students who are due for it. To students who really want to make the best of their industrial training, and also I wish to recommend firms who truly wish to assist students during the training period.