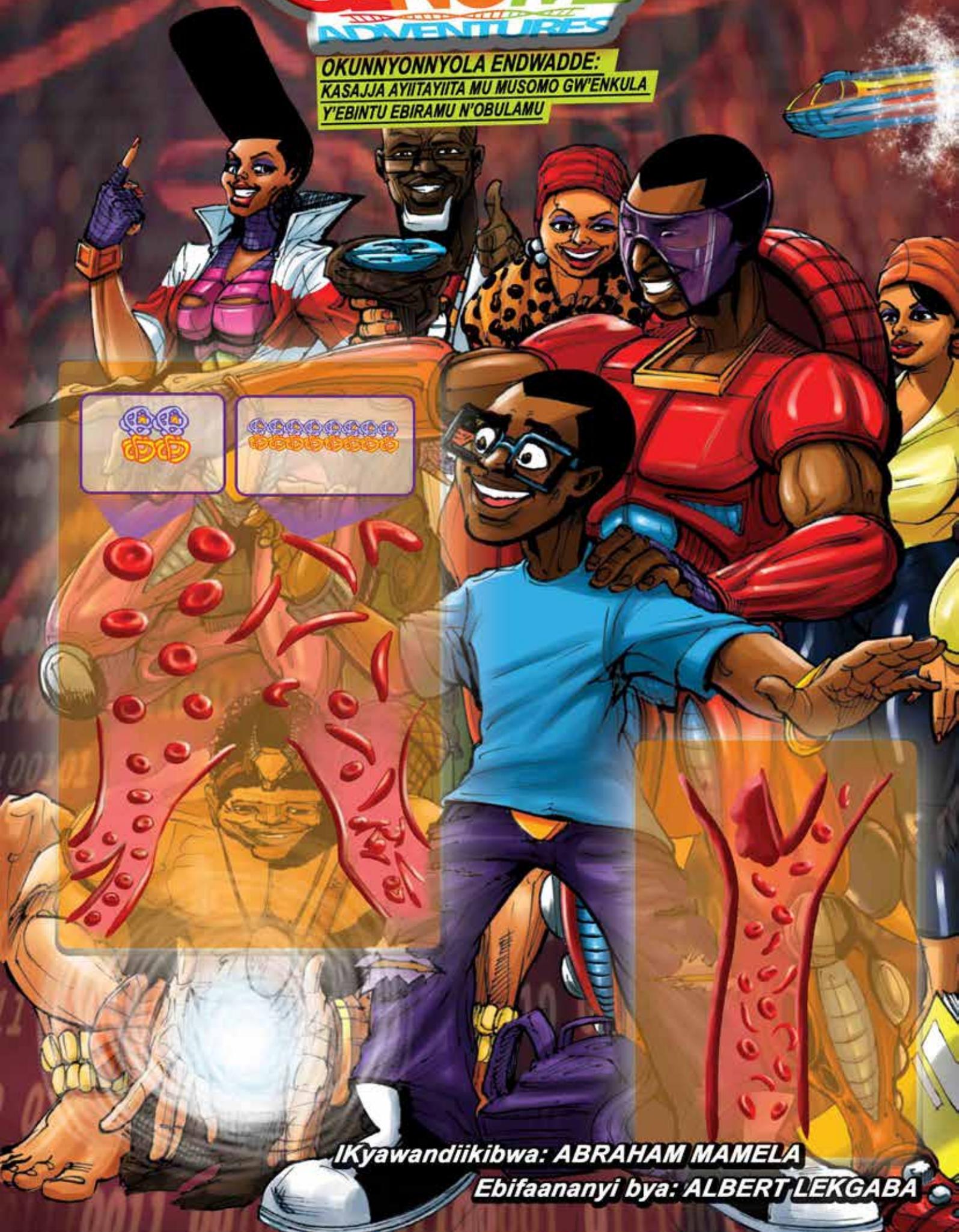


# GENOME

ADVENTURES

**OKUNNYONNYOLA ENDWADDE:  
KASAJJA AYIITAYIITA MU MUSOMO GW'ENKULA  
Y'EBINTU EBIRAMU N'OBULAMU**



**Ikyawandiikibwa: ABRAHAM MAMELA**

**Ebifaananyi bya: ALBERT LEKGABA**

## FOREWORD



The Ministry of Infrastructure, Science and Technology (MIST) has a mandate to provide and maintain building infrastructure, serve as a regulatory body for the use of nuclear technology and to coordinate Research, Science, Technology and Innovation. The key words science, research, technology and innovation define the core vision while consultation and collaboration with stakeholders are critical enablers of its mission. Broadly, MIST's stakeholders include artists and other players in the scientific arena.

The art industry plays a very crucial role in our society. Through art we can challenge our society's deepest assumptions, spark new ideas, inspire critical thought and vision and elicit new actions in society. Imaginations of future cities can come through the inspiration of artists. Through the use of cartoons and comics art can simplify and explain complex scientific concepts, demystify science and thus be a very powerful tool for communication. Therefore, we at MIST view art and artists as important collaborators and enablers of our vision and mission.

I am pleased to note that the Botswana-Baylor Children's Clinical Centre of Excellence (COE) is using art and comics to reach out, engage and educate the community on the complex topic of genes and how they relate to health and disease. In part fulfillment of the goals of the ongoing Collaborative African Genomics Network (CAfGEN) the COE has brought together a team of artists, cartoonists, scientists and journalists to develop a comic book series called Genome Adventures. Funded jointly by Wellcome Trust and the US National Institutes of Health, Genome Adventures is presented in four books. Those in the know will recall that in the first and second books, Kitso, the young hero of the series, with the assistance of several superheroes explored "Heredity and Genetics" and "Cracking the Code," respectively.

The current series of Genome Adventures consists of books three and four. In book three entitled "Decoding Disease" Kitso explores genes and health; and in the fourth entitled "Hope on the Horizon" he explores the intricacies of biomedical and genomics research. Through his amazing adventures Kitso travels the world, experiencing different cultures along the way as he learns about the link between health and genetics. As before, the books are presented in a pictorial and entertaining way using simple language and they can be enjoyed and understood by all. I understand the books will soon be translated into Setswana and several other African languages for greater reach. The Genome Adventures series clearly demonstrates that research and development offer great potential to solving societal problems; and further that even difficult scientific concepts can be communicated to all using comics. At MIST we salute all those involved in creating Genome Adventures. I wholeheartedly endorse this pioneering effort and urge those concerned to consider turning the books into a digie.

A handwritten signature in white ink, enclosed in a white circle. The signature appears to be 'Nonofo E. Molefhi'.

Nonofo E. Molefhi  
Minister for Infrastructure, Science and Technology

# KITSO



MULI MUTYAI NZE KASAJJA. MBEERA WANDEGEYA NE SSENGA. NJAGALA NNYO EBY'OKUVUMBULAI NNAZAALIBWA N'AKAWUKA AKALEETA MUKENENYA NAYE EKYO TEKINVUVUBA.

# DR. MABOKO



NZE NKULIRA EKIBINJA EKIVUMBUZI KU BY'OBUTONDE BW'EBIRAMU (NAKAYONDO ABEERE NGA ABAGAMBA KII) NNINA OBUSOBOZI OBUSAMAARZA OBUMPISA MU BISENGE NE MBUZAAWO SUKUUTA KANGE WANO ATE NENKADDIZAAWO ERI. SIKOMA AWO, MMANYA OMUNTU BY'ALOWOOZAI

# KGOSIGADI



NDI MUKYALA ATEEMOTYAMOTYA ERA OMUKULEMBEZE WA BANTU BANGE OWA NNAMMADDALA, BA NNAYUGANDA. NNYINZA OKUBALABIKIRA NGA JJAJJAMMWE OWA BULIJJO, NAYE OMUGGO GWANGE GWENTAMBUZA GULINA AMAANYI AG'ENJAWULO AGAAVA MU BA JJAJJANGE! NGA NKOZESA AMAANYI GANO, NNYINZA OKULOGE ENKUBA, OKULAGIRIRA ENSOLO, N'OKUKOLA EBYEWUUYISA EBIRALA.

# PHODISO

NZE PHILIPPA NAYE OYINZA OKUMPITA "SSENGA". BAABA BWE YAFA YANDEKERA OMWANA WE KASAJJA, ERA KASAJJA, MMWAGALA NGA BWE NJAGALA ABAANA BANGE ABALALAI TUBEERA FFENNA E WANDEGEYA, NGA WAKAVA OTI E KAMPALA TUYINZA N'OKUBEERA BALIRANWA BO!



# XGAO-TCGAI

NZE KWATA-MU NSAWO [OBA "KWATA" MU BUFUNZE]. NNENYUMIRIZA OKUBA OMUMBUTI- ABAMU ABANTU BANGE BABAYITA BA 'NNAKALANGA' OBA 'BUNNAKALANGA'. ERA NDI MUZIRA MU BAZIRA MU MAANYI G'OKUTAMBULIZA ABANTU MU BISEERAI ERINNYA LYANGE, NGA TOLIGENZE BUZIBA, LITEGEEZA 'OKULABA OKUSALA NG'AKAGIRITA' KUBANGA ENDABA YANGE NJOGI NGA AKAMBE AKOOGI ERA NSOBOLA N'OKULABA EBY'OMU MAASOI



# MARANYANE

MULI MUTYAI NGA ERINNYA LYANGE, MAKANIKA, BWE LIRI, NJAGALA EBY'EMIKONO. MWEKEBEJJE OMUBIRI GWANGEI EKITUNDU EKIMU KYUMA ATE EKRALA MUNTU. MU BWONGO NSAZA BUSAZA ERA NJAGALA OKUKOESA EBIKOZESEBWA EBYAKAFULUMAI



# MMATLI

NZE NNANZIRI. NDI MUNOONYEREZAI NANGE NNINA AMAANYI AG'ENJAWULO AGASOBOLA OKUTONIYA EBINTU OKUBITUUSA KU BUNENE BW'EBIRABIBWA GAALBINDI EZIZIMBULUKUSA ZOKKA NG'OMWO MW'OTWALIDDE N'ABANTUI NJAGALA EBYEWUUNYO SSAAYANSI BY'ATUYAMBA OKUVUBULA ERA NNANDIYAGADDE OKULABA ABAWALA ABATO ABALALA MU UGANDA NGA BAFUUKA BA NNASSAAYANSI NGA NZEI



NIMEKUWA NA MSHITUKO,  
LAKINI SINA MUDA TENAI



OWAAA, AKATOFFAALI  
KALI KA NGERI! KALI  
NGA OLUYUUYO!



KAFANANA NGA  
AKATOFFAALI  
K'OMUSAAYI  
OMULEMA!



EKYO KYE KKI?

KYE KINTU KYE TUSAANYE OKWGERAKO,  
KYOKKA TWETAAGA OKUKUGGYA MU  
BUTONO BWO, NNANZIRI, KA TUKOMYEWO  
KASAJJA EKA.

KIWULIKIKA BULUNGI,  
WEETEGESE, KASAJJA?

NNETEGESE.



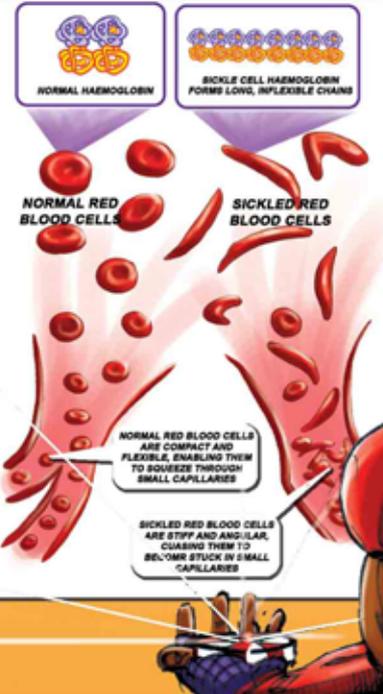
OWANGE, ESSANYU LYAGALA  
OKUNZITAI ANI YANDIROWOOZEZZA  
NTI EBINTU NKUMULIITU EBIGENDA  
MU MAASO MUNDA YA KA KIZIBWE  
KANGE AKATO?



ZOOOOOOP!

KYOKKA...KATOFFAALI KI AKO AKABADDE "AKALWADE" KENNALABYEKO NGA NDI KUMPI OKUKOMEKKEREZA OLUGENDO LWANGE?

SSI "KATOFFAALI AKALWADDE" KASAJJA KATOFFAALI AKEWESE. OKULABIKA KWAKO OKUSANYUSA NGA OKUTADDE WABBALI, OBUTOFFAALI OBWEWESE BULABAAFUNA NNYO OKUTUUSA OMUKKA OMULUNGI OGUSSIBWA MU BITUNDU BY'OMUBIRI. ABANTU ABALINA OBULWADDE BW'OBULEMA BW'OMUSAAYI BAYINZA OKUFUNA OBULUMI OBUNGI DDALA MU MIFUMBI GYABWE, OBUNAFU NEMITAWAANA GY'EBY'OBULAMU EMIRALA EGY'AMAANYI.



KATI OLWO TUMO AGENDA KULWALA?

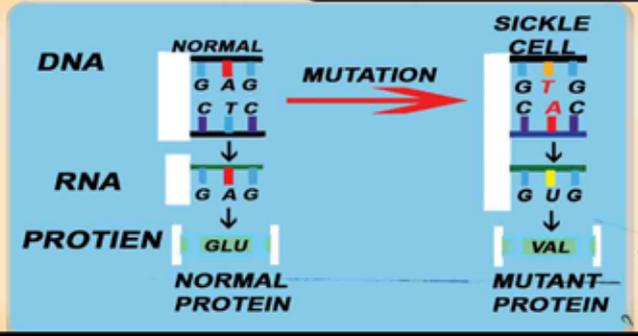
EBYO NGA BIRI AWO TUMO WANGE YAFUNA ATYA AKATAFFAALI AKEWESE?

ENKYUKAACYUKA? NGA ENKYUKAACYUKA EYABAAWO BWE NNATWALA KOPI GYE NNAYOKYAMU MU TTEREKERO LY'EBITABO?

KYEKYO KYENNYINI. OKUSINZIIRA KU KIKI EKIGGYIDDWAAKO, EKIGATTIDDWAAKO OBA OKUKYUSA MU NSENGEKA MU EKYEKYAMA KYA AKATOFFAALI AKAKOLA EKIRAMU KYONNA, ENKYUKAACYUKA ZIYINZA OKULEETA ENJAWULO EZ'OMUZINZI MU NDABIKA NE MU NKOLA Y'AKATAFFAALI. KU KYETWOGERA KO EKY'OBULWADDE BW'OBULEMA BW'OMUSAAYI, OKUKYUSA ESSIGA A N'OLIZZA KU T KIKUWA EKIZIMBA OMUBIRI EKYEKWATIRA AWAMU NE KINAANUULA AKATOFFAALI OKUKAGGYA MU NFAANANA YAKO EYEKINDAAZI OKUGIZZA MU Y'OLUYUUYO GYE WERABIDDEKO MU MUSAAYI GWA KAKIZIBWE KO AKATO.

KIZIBU OKUTEeba OBA ANAALWALA NGA OKYESIGAMYA KUKULABA AKATOFFAALI KAMU AKEWESE. SSENGA WO AJJA KUMUTWALA KU KIRINIKA AYONGERE OKUKEBEREWA. KYOKKA TEWERALIKIRIRAI ABANTU ABALINA OBULWADDE BW'OBULEMA BW'OMUSAAYI BABEERA MU BULAMU OBULUNGI KASITA OBULWADDE BWABWE BUBEERA BUKWATIBWA BULUNGI

OBUTOFFAALI OBWEWESE BUJJA KASITA WABEERAWO ENKYUKAACYUKA MU EKYEKYAMA KYA AKATOFFAALI AKAKOLA EKIRAMU KYONNA.



OKWOGERA KU KYEWERABIDDEKO, WALIWO OMU KU MMWE AWUNYIDDWA EKIRI MU KA NNAPI KA KAKIZIBWE AKATO? EEE!

SSSI NZE!

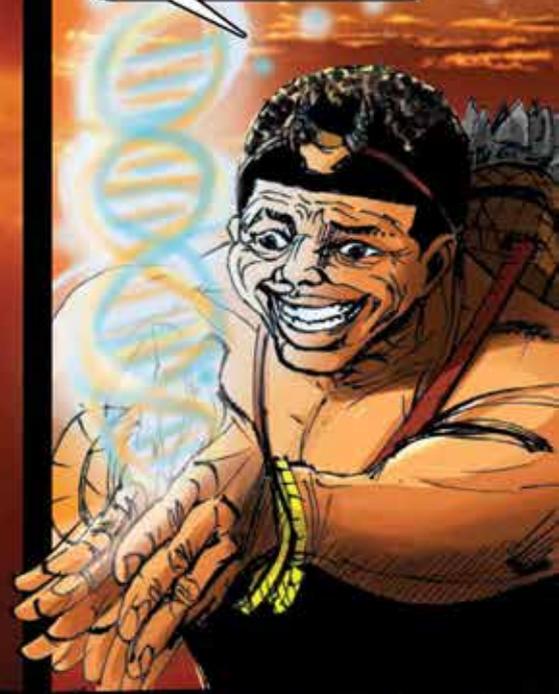
ESII, EKYO NDOWOOZA KIREKAWO NZE. JJANGU WANO, NANA.



KY'OGAMBA NTI  
KAKIZIBWE KANGE  
AKATO KALINA EKISOBU  
MU EKY'EKYAMA KYA  
AKATOFFAALI AKAKOLA  
EKIRAMU KYONNA?

ENKYUKAAYUKA KWE KUKYUSAAMU  
MU EKY'EKYAMA KYA AKATOFFAALI  
AKAKOLA EKIRAMU KYONNA.  
TETUZIYITA "BISOBYO" KUBANGA  
ENKYUKAAYUKA EZIMU MU MAZIMA  
ZITUYAMBA OKUGUMIRA EMBEERA  
EMPYA.

KIRABIKANGA ABATANDISE  
KU LUGENDO LWAFFE  
OLUDDAKOI!



OKUSINZIIRA KU KUNOONYEREZA  
KWANGE KU BY'OBUZAALIRWANA, BA  
JJAJJA BA KAKIZIBWE KO AKATO  
BAYA MU KITUNDU KYA AFRICA  
EKIYITIBWA ANGOLA.



OLWO?

OLWO KYE KISEERA  
OKULABA ENKYUKAAYUKA  
NGA ZIKOLA OGWAAZO,  
MUKWANO.

MWENNA MWESIBE ENKOBA!



ATE TUMO?

TUGENDA NAYE. KIMANYE  
NTI OKUNYUMYA KWONNA  
KUKWE.



BEM-VENDA A LUANDAI

KIYITIBWA BEM-VIN-DO  
SSI VEN-DA. LEKERA AWO  
OKWEPANKAPANKA NE  
BY'OTOMANYI.

OWAA?

KYABADDE AGEENZAako  
OKUGAMBA KIRI NTI,  
MWANIRIZIBBWA E  
LUANDA, EKIBUGA  
EKIKULU AKYA ANGOLA.

EISH, KYANDIBADDE KIRUNGI  
SSINGA SI NSIRI ZINO  
ZONNA!

KWAKO, WEFUUYIREKO  
KANO AKATTA EBIWUKA.

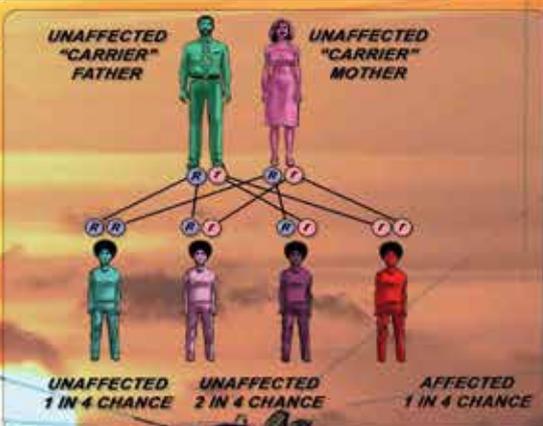
WEBALE! OTYO...LWAKI  
TUKOMYEWO WANO?

MUNNANGE KASAJJA, ANGOLA LY'EGGWANGA ERIRINA ABANTU  
ABALINA OBULWADDE BW'OBULEMA BW'OMUSAAYI ABANGI ENNYO  
MU NSI YONNA. BULI MWAKA, ABAANA ABAKUNUUKIRIZA MU  
MUTWALO GUMU (10,000) BAZAALIBWA N'ABWO. EKYEBAZIBWA,  
KIRI NTI ABASAWO N'ABAJJANJABI WANO BAKOLA EKIZUULA  
OBULWADDE BUNO NGA BUKYALI, OKUKAKASA NTI ABAANA BANO  
BAWEBWA OKULABIRIRWA KWE BEETAAGA.

LWAAKI OBULWADDE BW'OBULEMA  
BW'OMUSAAYI BUNGI NNYO WANO  
OKUSINGA MU BOTSWANA?

KIRINA AKAKWATE N'OBUTOFFAALI OBUKOLA EKIRAMU KYONNA BA JJAJJAABO BWE BAAKUWAI

BUKYA LUBA NGA LWA MMINDI LEERO NE KWATA ABADDEKO OMUTUUFU. OBULEMA BW'OMUSAAYI BUVA MU KUBEERA N'AKATOFFAALI AKAFUNJAMWAAKO, N'OLW'EKYO TEKATERA KULABIKA NNYO, NAYE NGA ATE KISOBOKA OKUTUTUNUKAYO LUNO NA LULI MU BAANA ABAAWEBWA AKATOFFAALI AKAKOLA EKIRAMU KYONNA OKUVA KU BA MAAMA BAABWE NE BA TAATA BAABWE.



NAYE EKISINGA OBUKULU KWE KUMANYA ENGERI ENKYUKAAKYUKA GYE YATUUKAMU EYO. KASAJJA, OJJUKIRA ENGERI GYE NNAKISIINYAAKO NTI ENKYUKAAKYUKA ZIYINZA OKUJJA KISOBOZESE EKINTU OKUYIGA OKUBEERA MU MBEERA EMPYA?

YYEE. KY'OGAMBA OBULEMA BW'OMUSAAYI BUYINZA OKUBEERA OBW'OMUGASO?

KALE, OKUFUNA OBUTOFFAALI OBUKOLA EKIRAMU KYONNA BW'OBULEMA BW'OMUSAAYI OBUBIRI KULINA EBIZIBU KU BY'OBULAMU EBY'AMAANYI. KYOKKA ERI ABO ABAAFUNA AKATOFFAALI AKAKOLA EKIRAMU KYONNA AKUVA ERI OMUZADDE OMU YEKKA BAYINZA OKUBEERA NGA BAFUNYE EKYO EKIBASOBOZESE OKWEWALA OBULWADDE OBW'AMAANYI OBULALA.

OMUSUJJA GW'ENSIRI!

MAZIMA? BULWADDE KI OBWO?

OMUSUJJA GW'ENSIRI? EKINTU KY'OFUNA OKUVA KU NSIRI?

KY'EKYOI OBUTOFFAALI  
OBWEFUNYIZZA SI BUGAZI  
EKIMALA OKUSOZOZESA  
OBUWUKA BW'OMUSUJJA  
GW'ENSIRI OKUGYA ERA N'O.

OBUTOFFAALI OBUKOLA EKIRAMU  
KYONNA BUYINZA OKUBEERA OBUZIRA  
ENNYO SSINGA BUBA BU KISSIZZAAKO  
OMWOYO.

OWANGEI KATI OLWO TUMO  
AYINZA OKUBEERA NGA  
TAKWATIBWA MUSUJJA GWA  
NSIRI? KUBAGANYAKUBAGANYAAMU?



EKY'EKYAMA KY'EKIKOLA EKIRAMU KYONNA  
KIYIGA OKUBEERA MUMBEERA EMIRUNDI  
MINGI N'OKUSINGA BW'OLOWOOZA, MU  
KUYITA MU KKUBO ERIYITIBWA  
OKWEROBOZA KW'OBUTONDE. OBUTOFFAALI  
OBUKOLA EKIRAMU KYONNA OBUTAASA  
ABANTU ENDWADDE BUTERA NNYO OKUVA  
KU MULEMBE OGUMU OKUDDA KU MULALA.

OBA OLI AWO EYO GYE BUJJA,  
BULIBEERA BUTOFFAALI BWAFFE  
OBUKOLA EKIRAMU KYONNA  
OBULIYAMBA OKULWANYISA  
OBULWADDE BWE TUTAYINZA  
KUJJANJABA KATI.

OOOOOOM... OBA OLI  
AWO OBUTOFFAALI  
BWANGE OBUKOLA  
EKIRAMU KYONNA  
BUYINZAOKUTUYAMBA  
OKULWANYISA AKAWUKA  
KA MUKENENYAI!



TULINA ENSONGA  
OKULOWOOZA NTI  
BWATUUKA YO DDAI!

YYEE, KASAJJA, OMANYI NGA  
BW'OLINA OKUPIMIBWA  
OBUSIRIKALE BWO OBW'OMU  
MUSAAYI BULI LUVANNYUMA  
LW'EMEZEZI EMITONO KU KIRINIKA?

OMANYI KKI  
OBUSIRIKALE  
BW'OMUSAAYI  
KYE BULI?

MAZIMA?

YYEEEE...



OBUSIRIKALE BW'OMUSAAYO BE BASIRIKALE ABAYAMBA OKULWANYISA OBULWADDE. SSINGA MMIRA EDDAGALA LYANGE, OWAAKABI YEEBAKA, OLWO OBUSIRIKALE BWANGE NE BUSIGALA WAGGULU.

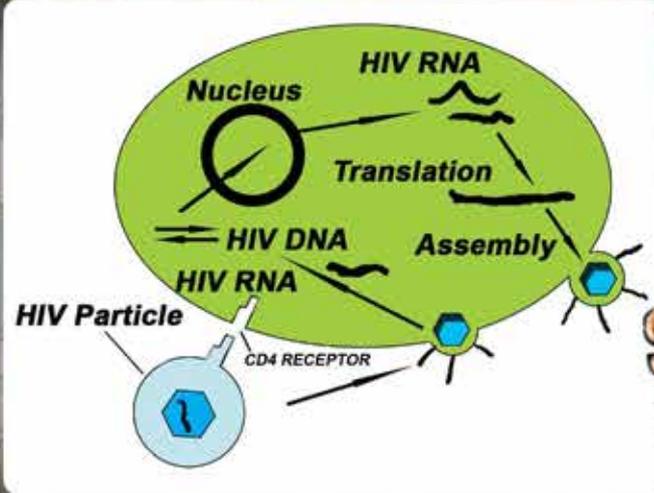
EKYO KITUUFUI ABASIRIKALE BO TUBAYITA "OBUSIRIKALE BW'OMU MUSAAYI" KUBANGA BUBIKKIDWA OBUNTU OBUFUNYI BU CD4. OKUBEERA N'OMUWENDO GW'OBUSIRIKALEOBULINA OBUFUNYI BU CD4 OGWA WAGGULU.

KITEGEEZA NTI AMAANYI GO AGALWANYISA OBULWADDE MANGI. NAYE OBUSIRIKALE BULI NGA OLUGGI LUNO. LWE LUGGI OLUYINGIRA MU BUTOFFAALI BWO OBUKUKUUMA.



AKAWUKA KA MUKENENYA—AKASAJJA AKAAKABI—KALUMBA NGA KEEKWATA KU OBUFUNYI BU CD4 OLWO NE KAYINGIRA MU KATOFFAALI OLWO NE KAZAALA. KAAKATI, KIBA KITYA SSINGA MBAGAMBA NTI TUYINZA OKUSIBA OLUGGI LU CD4OLUYINGIRA MU BUTOFFAALI BWAFFE OBUTUKUUMA NE BUSIBIRA AKAWUKA KA MUKENENYA EBWERU?

EKYO KISOBOKA?



YEE, CCR5 Y'EKKUFULU KU LUGGI LU CD4. AKAWUKA KA MUKENENYA KAKOZESA EKISUMULUZO KY'EKKUFULU ENO OKUGGULAWO OLUGGI LU CD4, WABUULA KIRABIKA NTI OBUTOFFAALI OBUKOLA EKIRAMU KYONNA OBWA ABANTU ABAMU BWA BAKOZESA AKAFUNYI KA CCR5 EYAKYUKAAYUKA, EKIREKA NGA AKAWUKA KA MUKENENYA NGA TEKALINA NGERI GYE KAGGULA LUGGI LU CD4. KATI TEEBA?

NTEEBE KI?

KY'OGAMBA NTI AKAWUKA KA MUKENENYA TEKAYINZA KUYINGIRA MU KATOFFAALI?

ABAMU KU BANTU ABO TEBAKWATIBWA KAWUKA KA MUKENENYA.



EKYO KITUUFU. AKAWUKA KA MUKENENYA TEKATUUKIRIZA KYA KUYINGIRA MU KATOFFAALI. ERA OLW'OKUBA NGA TEBUYINZA KUYINGIRA MU ATAFFAALI, TEBUNYINZA KULWAZA MUNTU.

OWAAA! KALE BAMBI SSINGA BULI BUTOFFAALI BW'OMUNTU YENNA OBUKOLA EKIRAMU KYONNA BUSOBOLA OKUTONDA CCR5 EYAKYUKAAYUKA.

NZIKIRIZIGANYA. EBY'EMBI, ENKYUKAAYUKA Z'OBUTOFFAALI OBUKOLA EKIRAMU KYONNA ZITWALA EBBANGA G6WANVU, G6WANVU NNYO NNYO OKUSINGA EBBANGA AKAWUKA KA MUKENENYA LYE KAMAZE NGA KATALAAGA ENSI.

KATI OLWO ABANTU ABAMU BASOBOLA BATYA OKUBEERA NGA BAAFUNA DDA CCR5 EYAKYUKAAYUKA?

EBYAFAYO BIYINZA OKUTUBUULIRAI ABANTU ABAMU BAKKIRIZA NTI ENKYUKAAYUKA CCR5 YA BANTU BA MULEMBE MULALA OGW'ENJAWULO DDALA.

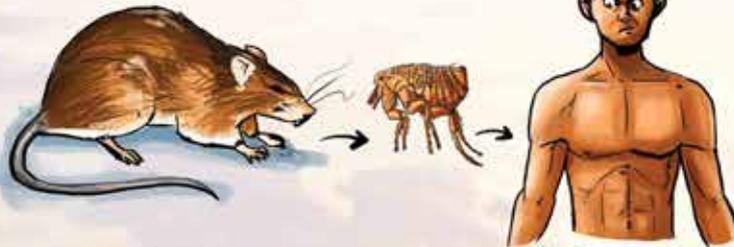
OMULEMBE GW'ABALINA KAWUMPULI.

EKYO KIDDAYO ERI KU KYASA KY'EKKUMI N'EBINA OBULWADDE OBWATYEBEKEKWAKO ERYA "BLACK DEATH" LWE BWAKUNTA NGA KIBUYAGA MU BULAAYA NE BUTTA ABANTU BUKADDA NA BUKADDE.

OBULWADDE BU BLACK DEATH-OBWO SI BWE BULWADDE OBULEETEBWA EMMESE?

KATONO OKITUUKE, KASAJJA. OBULWADDE BU BLACK DEATH BULEETEBWA AKAWUKA AKASIRIKITU ENNYO AKAYITIBWA -YERSINIA PESTIS -AKAGGYIBWA ENKUKUNYI MU MMESE NEEKATWALA MU MUNTU NGA EMULUMYE.

NGA BWE KIRI NTI ABANTU ABASING OKUBA NGA BALINA CCR5 EYAKYUKAAYUKA BABEERA BULAAYA EY'OMUMAMBUKA, TOYINZA KU KYEBEERA OKWEWUUNYA NTI OSANGA OBUTOFFAALI BWABWE OBUKOLA EKIRAMU KYONNA BWALI BUTOLOKA KU "BLACK DEATH" ATE MU NGERI EMU BWESITTALA KU BUKUUMI OBUZIYIZA AKAWUKA KA MUKENENYA.



INFECTED RODENT

RAT FLEA

HUMAN HOST

OWAAA, EKYO KYEWUUNYISA, NAYE...

KI KYAMU KI, KASAJJA?

KALE, OBULEMA BW'OMUSAAYI, AKAWUKA KA MUKENENYA, BLACK DEATH... KALE BAMBI SINGA ABANTU BAALI TEBALINA KULWALA

ZWIIISHI

NKITEGEERA. TOOFAAYO, MMANYI EKIGENDA OKUKUWULIZA OBULUNGI. KA TUFUNE EKYEMISAANA OKUVA KU MULIRAANO. EBYOGERWA KU ENKULA Y'EBINTU EBIRAMU OKWEGWAANYIZA EMBEERA TEBINNAGGWA!

TUKWANIRIZZA GHANZI  
DISITURIKITA EYA KALAHARI.

MEKETA KU BU  
MPWAKIPWAKI!

NGA OKULABIBALABIKA  
KWA OBULEMA BW'OMUSAAYI  
MU ANGOLA, AKAFUBA (TB)  
KAKWATA ABANTU B'E  
GHANZI DISITURIKITA MU  
BUNGI OBUSUKKIRIDDE.

EKYO OKIROWOOZA  
OTYA OKUMPULIZA  
OBULUNGI?

KALE, WALIWO EGGULIRE  
ERY'ESSANYU, YADDE MU  
MASEKKATI G'OBULWADDE.  
EBISEERA EBY'OMU MAASO  
BIGAGGAWAZIBBWA EBISOBOKA.

BA NNASSAAYANSI KATI BAYIGA  
N'AKAFUBA NAKO KALINA  
OBUTOFFAALI OBWAKO KOKKA  
OBUKOLA EKIRAMU KYONNA  
OBUYINZA OKUTUTUUSA KU  
KUKAWONYEZA DDALA.



KIRABIKA NGA KASAJJA  
AJJA OKUGANYWULWA  
MU KULINGIZAAKO MU...

OWAAI!

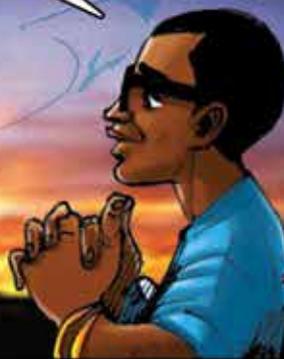
EYO GYE BUJJA, TUJJA KUBA NGA  
TUFUNA OKUMANYISIBWA ENNYO,  
OKUSINGIRA DDALA KU MUSOMO  
GWE BY'OBUTONDE BW'EBINTU  
EBIRAMU. ABANTU BAJJA KUBEERA  
NGA BASOBOLA OKUJJANJABA  
OBULWADDE NGA AKAFUBA, AKAWUKA  
KA MUKENENYA, N'OBULEMA  
BW'OMUSAAYI MU NGERI ESINGAKO  
OBULUNGI.



GHANZI DISITULIKITA  
EJJA KUBEERA EKIFO KYA  
BULAMU OKUSINGA EBIRALA.

OLI MUTUUFU, KWATA. KINO  
KIMPULIZA BULUNGI. EBISEERA  
BY'OMU MAASO BITANGAAVUI KALE  
SSINGA SI PPEREKETYA WA MUSANA  
ONO KATI....

EKYO SSIYINZA KU  
KIKOLAKOI WABULA  
TWETAAGA OKUGENDA  
E KGOTLA.....





ERA NJA KWETAAGAYO  
ENJUNDA EZIJUZIDDW  
AMAZZI.

NNINA ENTONOTONO  
WANO WENNYINI!

GIVE US HEAVY SHOWERS,  
OPEN UP THE HEAVENS AND  
POUR OUT THE RAINDROPS;  
GOOD RAIN, THAT IS VERY  
GENTLE, NOT LIKE SPEARS;  
A WASHING OF THE EARTH;  
A FEMALE, HEAVY RAIN IN  
THIS TIME!

TUWE ENKUBA ENNYINGI,  
GGULAWO EGGULU OTONNYESE  
BULI TTONDO LY'AMAZZI;  
ENKUBA ENNUNGI, ENJNOONVU  
ETERINGA MAFUMU; ENJOZI  
Y'ENSI; OMUKAZI, ENKUBA  
ENNYINGI KU LUNO'



KIYITIRIVU!



BWE TUNAAGENDA MU MAASO  
NGA TULI BAKUUMI  
AB'EBITWETOLODDE N'EBY'OBUGAGGA  
BYAFFE ABALUNGI, EBISEERA EBY'OMU  
MAASO BIJJA KUBEERA BIYITIRIVU.

KALE, TUMO ATANDISE  
OKWESUNGUWAZASUNGUWAZA  
KATI. NDOWOOZA KYE  
KISEERA TWOLEKERE ERIDDA  
EKA.



NDOWOOZA OLI  
MUTUUFU NAKAYONDO.



MAAMA!!

OTYO..KATI OLWO  
EBISEERA EBY'OMU  
MAASO BINATUUKA  
DDI? NNINA KUBEERA  
AWO NGA NNINDA  
KUTUUSA OKUWONYA  
LWEKUNAAZUULIBWA?

EBISEERA EBY'OMU MAASO BIYINZA OKUBA NGA BIKULI KUMPI OKUSINGA NGA BW'OLOWOOZAI

MU MAZIMA OYINZA OKUYAMBA OKUTUTUUSAYO.

MAZIMA? NAYE NZE NDI KAAANABWANA.



GENOME-WIDE ASSOCIATION STUDY OKUNOONYEREZA KUNO KWE KUGEEZAAKO OKUZUULA LWAKI ABANTU AB'ENJAWULO OBULWADDE BUBAYISA MU NGERI ZA NJAWULO NGA BUBALUMBYE. MUKWENYIGIRA MU KUNOONYEREZA KKWA K GALAGADI AKAWUKA KA MUKENENYA/AKAFUBA, ONO OBA OTUSENVUZZA EDDAALA LIMU OKUTUYINGIZA MU BISEERA EBY'OMU MAASO EBY'OBULAMU OBULUNGI.



OSANGA TUYINZA OKUKUBA AKAFANANYI AKALAGA LWAKI AKAWUKA KA MUKENENYA N'AKAFUBA BYEYISA MU NGERI GYE BYEYISAAMU. OBA OLI AWO NE TUSOBOLA OKUZULA AMAKUFULU G'ENZIGI-GAMBA NGA CCR5 EYAKYUKAAYUKA -TUZIYIZE ENDWADDE OKUSAASAANA.

OJJUKIRA LWAKI TWATANDIKA OKUVUMBULA KUNO? BWE WEGATTA KU KUNOONYEREZA KU KAWUKA KA MUKENENYA/AKAFUBA OKULI E K GALAGADI, OKUYITIBWA GENOME-WIDE ASSOCIATION STUDY.



EBIKI?



OLOWOOZA OTYA, KASAJJA?

WETEGESE OKWENYIGIRA MU KUNOONYEREZA, OTUVUUMUULE PAKA MU BISEERA EBY'OMU MAASO?

ERA OBA OLI AWO, MU KUKOLA EKYO, KIJJA KUKYUSA OMUGENDO GW'EBYAFAYAAYO?

NDOWOOZA MMAZE OKUTUUKA KU KUSALAWO KWANGE.



# EBINNYONNYOLA

## EBIKOZESEBWA MU SSAAYANSI

**OBUFUNDAMWAKO OBUTESIGAMA KU KIKULA KYA MUNTU-** OBUSIKA BW'ENJAWULOYAWUL OBA ENDWADDE OMULI NTI EBIKOLA EKIRAMU KYONNA BY'OMBI WEBIRI OMUNTU OYO ALYOKE AFUNE EKY'ENJAWULOYAWULO OBA OBULWADDE.

**OBUSIRIKALE BW'OMUSAAYI-**

OBUTOFFAALI BW'OMUSAAYI OBUTALINA LANGI OBWENYIGIRA MU KULWANYISA OBULWADDE. BUNO BWE BUTOFFAALI OBULUMBIBWA AKAWUKA KA MUKENENYA ERA BWE BUTOFFAALI AKAWUKA MWE KAZAALUKUKIRA.

**CCR5-** EKIZIMBA OMUBIRI EKIBEERA KU BUTOFFAALI BW'OMUSAAYI OBUTALINA LANGI OBUKOLA NGA EKINYINGIRIRWAMU AKAWUKA KA MUKENENYA. AKAWUKA KA MUKENENYA EBISEERA EBISINGA KAKAKOZESA CCR5 OKUYINGIRA MU BUTAFFAALI BWE KATEEGA. ABANTU ABAMU BABEERA NE CCR5 EYAKYUKAAYUKA ERA TEBATERA KU KWATIBWA KAWUKA KA MUKENENYA.

**OKULONDAMU KW'OBUTONDE-** ENKOLA EREETERA EBINTU EBIGUMIRA EMBEERA GYE BIRIMU OKUSINGA KU BINNAABYO BITERA OKUWANGAALA EKIWANVU ERA NE BIZAALA NE BINNAABYO. EKIROWOOZO KINO KYAYANJULWA CHARLES DARWIN.

**OBULEMA BW'OMUSAAYI-** AKATOFFAALI K'OMUSAAYI AKEEWESEEMU NGA OMWEZI OGW'EGGABOGGABO AKALINA EKYETIKKA EMPEWO ESSIBWA ENNAMU EKITAKOLA BULUNGI. OBUTOFFAALI BUNO OBWEWESE BULEETEBWA OBULWADDE OBW'ENSIKIRANO OBUYITIBWA OBULEMA BW'OMUSAAYI. OBUTOFFAALI OBWEWESE BUZIBUWALIRWA OKUTAMBUZA EMPEWO ESSIBWA OKUGITWALA MU BITUNDU BY'OMUBIRI EBITALI BIMU.

**THE BLACK DEATH** –ERA OBUMANYIDDWA NGA KAWUMPULI; BWE BUMU KU BULWADDE MU BYAFAAYO OBWASINGA OBUKAKALI OBWASAASANIRA AMAWANGA GONNA OBULEETEBWA AKAWUKA AKALWAZA AKAYITIBWA YERSINIA PESTIS

**OKUKKIRIZA KW'ATANNEETUUKA-** ENDAGAANO EKOLEBWA OMUNTUATASOBOLA KUKKIRIZA MU MATEEKA AMATUUFU, NGA AKOZESA OKUKKIRIZA NG'OMAZE OKUTEGEEZEBWA

**OKUKKIRIZA NG'OMAZE OKUTEGEEZEBWA OKUGAZIYIZIBWA-** ABEENYIGIRAMU MU KUNOONYEREZA OKW'EBY'OBUSAWO BAWA OKUKKIRIZA NGA OMAZE OKUTEGEEZEBWA OKUKOZESEBWA MU KUNOONYEREZA OKW'OMU MAASO

**EKYETOLOOZATOLOOZA-** EKYUMA EKIKOZESEBWA AWAKEBERERWA OMUSAAYI OKWAWULA OLUZZIZI OLW'OBUZITO OBW'ENJAWULO, NGA LWETOLOOZATOLOOZA EBY'OLUZZIZI KU MBIRO EMPITIRIVU ENNYO.

**OKUKKIRIZA NGA OMAZE OKUTEGEEZEBWA-** ENDAGAANO EKOLEBWA OMUNTU AKKIRIZIBWA MU MATEEKA OKUWA OKUKKIRIZA NGA AMAZE OKUTEGEEZEBWA.

**OKUSENGEKA DNA-** ENKOLA ESOBOZESA ENTEEKATEEKA Y'OBUSIGA MUNDA Y'OLUWUZI LWA DNA.

**EKIBALA OBUMUNYEENYA-** EKYUMA EKIKOZESEBWA OKUPIMA OBUNGI BW'OKUMUNYEENYA OKUMANYA OBUNGI BW'EKINTU EKIPIMWA WE BWENKANA.

**OKULWAWO OKUGWA WANSI-** ABANTU ABALINA AKAWUKA KA MUKENENYA ABATWALA EBBANGA EGGWANVU OKULAGA OBUBONERO, OKUVA KU BISEERA LWE BASOOKA OKUBULAGA.

**AGGYAKO OMUSAAYI (KAFUMISI)-** ABANTU ABATENDEKEBWA OKUGGYA OMUSAAYI OKUVA KU BALWADDE, OKUGUGABA, OKUGUGUSSA MU MUNTU OMULALA OBA OKUGUKEBERA MU KYUMA.

**AYANGUWA OKUGWA WANSI-** ABANTU ABALINA AKAWUKA KA MUKENENYA ABANGUYIRIZA OKULAGA OBUBONERO, OKUVA KU BISEERA LWE BASOOKA OKUBULAGA.

**REAGENTS-** EBIRUNGO EBIRALA EBITEEKEBWA MU MUSAAYI OKUKUTULAKUTULA OBUTOFFAALI N'OKUGWAWULAKO DNA.

**AKAWULIRIZA-** EKINTU EKIKOZESEBWA ABASAWO OKUWULIRIZA AMALOBOOZI AGAKOLEBWA MUNDA MU MUBIRI OKUGEZA NGA OKUKUBA KW'OMUTIMA.

**OKUMENTULA EKY'EKYAMA : KASAJJA AYITAAYITA MU  
DNA NE MU BUTOFFAALI OBUKOLA EKIRAMU KYONNA.**  
EKYAWANDIIBWA MU NSI BOTSWANA MU KIRINIKA Y'ABAANA BOTSWANA-BAYLOR  
OMUTENDERA OGUSOOKA (1.0), KYASOOKA KUFULUMIZIBWA MU 2015 OBWANNANYINI ©  
BOTSWANA-BAYLOR CHILDREN'S CLINICAL CENTRE OF EXCELLENCE 2015

## **OKWEBAZA**

**ABATONDAWO PULOJEKITI N'ABAGIYIYA:** ABRAHAM MAMELA, ALBERT LEKGABA, EDWARD PETTITT

**ABAWANDIISI B'OMUZANNYO:** STEPHEN ALEXANDER MANNING, NATASHA MORAKA, JONATHAN STRYSKO, TSWELELOPELE MASUTLHA, TIERRA HOLMES, AAMIRAH MUSSA,NIKA SOON -SHIONG,ZACK BONZELL

**ABAKUNJAANYA BE BY'OBUSAWO/BE BYA SSAAYANSI:** MASEGO TSIMAKO-JOHNSTONE, SEBALD VERKUIJIL

**ABAYAMBI MU PULOJEKITI:** THATO REGONAMAYE, TAPIWA KANGWA

**ABAVUBUKAABALINA KYE BASSAAMU:** ANNAH KETLAARENG

**ABANOONYEREZA MU CAFGEN (BOTSWANA-BAYLOR CHILDREN'S CLINICAL CENTRE OF EXCELLENCE):**  
GABRIEL ANABWANI, MBCHB, MMED, MSCE, FRCPE; MOGOMOTSI MATSHABA, MBBCHEAO, BMEDSCI;  
KEOFENTSE MATHUBA; OLEKANTSE MOLATLHEGI; ABHILASH SATHYAMOORTHI; JOHN FARIRAI;  
LEANO PHETOGO; KENNEDY SICHONE; MASUTLHA TSWELELOPELE, CLINS MMUNYANE, PINKIE  
GOBUAMANG

**AKAKIIKO AK'ABAWI BA CAFGEN AMAGEZI AB'OMUKITUNDU:** SHEIK H. HASSAN (BOTSWANA MUSLIM ASSOCIATION); TIDIMALO DENNIS (BOPHA: BOTSWANA PUBLIC HEALTH ASSOCIATION); CINDY KELEMI (BONELA: BOTSWANA NETWORK ON ETHICS, LAW, AND HIV/AIDS); IRENE KWAPE (BOCAIP: BOTSWANA CHRISTIAN AIDS INTERVENTION PROGRAMME); PHENYO MAHUMA (BCC: BOTSWANA COUNCIL OF CHURCHES); ALICE MOGWE (DITSHWANELO: THE BOTSWANA CENTRE FOR HUMAN RIGHTS); KGORELETSO /NAKAYONDO MOLOSIWA (BONEPWA+: BOTSWANA NETWORK FOR PEOPLE LIVING WITH LLLV AND AIDS); ONKEMETSE MONTSHEKI (CHILDLINE BOTSWANA); JOB MORRIS (SAN YOUTH NETWORK); KAGO MOTEKETELA (YOUTH MEMBER); BUYANI ZONGWANI (MISA: MEDIA INSTITUTE OF SOUTHERN AFRICA)

**OKKUVUNULA O'LUNGEREZA KWAKOLEBWA:** JACQUELINE BALUNGI KANYWA, ISREAL KALYESUBULA  
**OKKUVUNULA O'LUGANDA KWAKOLEBWA:** MUGEMBA JAMES KATUMBA, PATRICK MASEMBE

## **OKWETEGULA**

YADDE TUKOZE EKISOBOKA OKULABA NTI SSAAYANSI AKOZESEBBWA YOYO OMUTUUFU, EBIWAN-  
DIIBWA MU KITABO KINO TETEGEREZA NTI MAGEZI AGAWEEBWA BY'OBULAMU. ETTEKA GYE LIVA  
NE GYE LIKOMA, ABAWANDIISI N'ABAABUKA MU KYAPA EKITABO KINO N'ABAKOZI BAABWE TEBAKKI-  
RIZA OKUVUNAANYIZIBWA EBY'OBULABE, EBY'OKUFIRIZIBWA OBA EBY'OKWONOONA BYONNA EBI-  
NATUUKA KU MUNTU EYESIGAMA ENNYO KU BYE TUWANDIISE.

## **EKITABO KINO TWAKISSAAKO ENVUMBO**

TEWALI KITUNDU KY'EKITABO KINO EKIJJA OKUWANDIIBWA NATE, OBA OKUTEEREKEBWA MU BYUMA  
BI KALIMAGEZI OKUKISOBOZESA OKUGGULIBWAWO NATE MU BYUMA EBIRALA OBA OKUWEEREZEBWA  
MU NSABIKA EYA BULI NGERI OBA OKUYISIBWA MU MIKUTU EGITALI GIMU NGA OKUYITA KU  
MUTIMBAGANO, OKWETIKKIBWA, OKUKOPPOLOLWA, OKUKWATIBWA KU KATAMBI OBA MU KUYITA  
MUNGERI ENDALA ZONNA AWATALI KUWEEBWA LUKUSA OKUVA KIRINIKA Y'ABAANA EYA BOTSWANA  
ESANGIBWA KU KIBANJA 1836 KU LUGUUDO HOSPITAL WAY, MU DDWAALIRO PRINCESS MARINA  
HOSPITAL, KU NDAGIRIRO PRIVATE BAG BR 129, GABORONE, BOTSWANA

# GENOME ADVENTURES

OBUVUMBUZI BWE BY'OBUTONDE BW'EBINTU EBIRAMU KYA KUYIYA KYA COMMUNITY ENGAGEMENT INITIATIVE OF THE COLLABORATIVE AFRICAN GENOMICS NETWORK (CAFGEN) EKISASULIRWA WELCOME TRUST. CAFGEN KIRI MU KIBIINA KYA HUMAN HEREDITY AND HEALTH IN AFRICA CONSORTIUM (H3AFRICA) KIKUBERIZIBWA AB'EDDWAALIRO LY'ABAANA ERIYITIBWA BOTSWANA-BAYLOR CHILDREN'S CLINICAL CENTRE OF EXCELLENCE (COE). OBUVUMBUZI BWE BY'OBUTONDE BW'EBINTU EBIRAMU KIKOZESA AMASOMO AGAFUULA ABANTU OKUBEERA AB'OBUSOBOZI, EMIZANNYO EGIYIGIRIZA, WAMU N'EMPULIZIGANYA EZ'OLUKALE OKUKUNGA ABATUUZE BE KIKWATAKO, BANNAMAWULIRE ERA N'ABANTU BONNA OKUTWALIRA AWAMU- OKUSINGIRA DDALA ABAVUBUKA- MU ESSOMO MU MUSOMO GW'ENKULA Y'EBINTU EBIRAMU NE MUKUNOONYEREZA KU BY'OBUTONDE BW'EBY'OBUSAWO. EKIGENDERERWA KY'OBUTABO BWAFFE OBW'EBYOBUVUMBUZI BWE BY'OBUTONDE BW'EBIRAMU KWE KUSOMESA ABASOMI EBYAFAAYO BY'ENSIRIRANO N'OMUSOMO GW'ENKULA Y'OMUNTU, ENKULA N'ENKOLA YA DNA N'OBUTOFFAALI OBUKOLA EKIRAMU KYONNA, OLUJEGERE OLUGATTA ESSOMO MU MUSOMO GW'ENKULA Y'EBINTU EBIRAMU. N'OBULAMU, N'ENGERI Y'OKWEWANDIISA MUKUNOONYEREZA MU BY'OBUTONDE BW'EBY'OBUSAWO OBA ESSOMO MU MUSOMO GW'ENKULA Y'EBINTU EBIRAMU, NGA MW'OTWALIDDE AMATEEKA AGAFUGA OKUKOLA OKUNOONYEREZA AGEKUUSA KU KUKKIRIZA NGA OMAZE OKUTEGEEZEBWA/OKUNNYONNYOLWA, OKUTAMBUZA N'OKUTEREKA EBIGGYIDDWAKO OLW'OKUNOONYEREZA N'OKUSOBOZESA ABATUUZE B'OMUKITUNDU OKWENYIGIRAMU.

BW'OBERA NGA WANDIYAGADDE OKUMANYA EBISINGA EBITUKWATA KO, GENDA KU MIKUTU GY'EMPULIZIGANYA FACEBOOK, TWITTER,

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*Abaasobozesa omulimu*

**wellcome**trust & NIH