

SLEEPING SICKNESS

THE FIGHT AGAINST A NIGHTMARISH DISEASE





University
of Glasgow

Supported by
wellcometrust

Wellcome Trust
Centre for Molecular
Parasitology

'SLEEPING SICKNESS: THE FIGHT AGAINST A NIGHTMARISH DISEASE' IS © WELLCOME TRUST CENTRE FOR MOLECULAR PARASITOLOGY, JAMIE HALL AND EDWARD ROSS, 2016.

A COMIC WRITTEN BY JAMIE HALL AND EDWARD ROSS. ILLUSTRATED BY EDWARD ROSS.
SCIENTIFIC ADVISOR: DR. ANNETTE MACLEOD.

ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, INCLUDING PHOTOCOPYING, RECORDING OR BY ANY INFORMATION AND STORAGE RETRIEVAL SYSTEM, WITHOUT PRIOR WRITTEN CONSENT OF WTCMP OR THE AUTHORS.

PUBLISHED BY WELLCOME TRUST CENTRE FOR MOLECULAR PARASITOLOGY, SIR GRAEME DAVIES BUILDING, UNIVERSITY OF GLASGOW, 120 UNIVERSITY PLACE, GLASGOW G12 8TA.

PRINTED ON 100% RECYCLED PAPER.

SLEEPING SICKNESS

THE FIGHT AGAINST A
NIGHTMARISH DISEASE

By EDWARD ROSS AND JAMIE HALL

SLEEPING SICKNESS
HAUNTS ME.



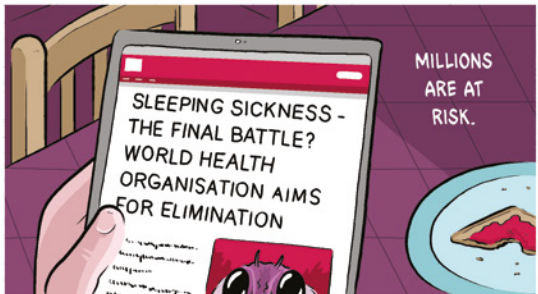
I'M LUCKY ENOUGH NOT TO HAVE THE DISEASE, BUT FOR TOO MANY PEOPLE THIS NIGHTMARE IS **VERY REAL**.



FOR YEARS I'VE BEEN TRYING TO UNDERSTAND SLEEPING SICKNESS AND THE TINY PARASITES THAT CAUSE IT.



IT'S A TERRIBLE ILLNESS THAT AFFECTS TENS OF THOUSANDS OF PEOPLE IN SOME OF THE POOREST COUNTRIES IN THE WORLD.



SLEEPING SICKNESS - THE FINAL BATTLE? WORLD HEALTH ORGANISATION AIMS FOR ELIMINATION

MILLIONS ARE AT RISK.



IT STRIKES PEOPLE DOWN WITH FEVER, INSOMNIA, HEADACHES AND COMA. SYMPTOMS ARE DEBILITATING AND IT'S ALMOST ALWAYS DEADLY WITHOUT TREATMENT.



WHERE IT STRIKES FARM ANIMALS, IT DESTROYS LIVELIHOODS AND LOCAL ECONOMIES.



THIS IS MORE THAN JUST A PASSING INTEREST FOR ME. I'VE SPENT THE LAST 20 YEARS INVESTIGATING SLEEPING SICKNESS, TODAY WORKING AT THE **WELLCOME TRUST CENTRE FOR MOLECULAR PARASITOLOGY**, ONE OF THE WORLD'S LEADING INSTITUTES FOR PARASITE RESEARCH.

WE MAY BE THOUSANDS OF MILES FROM WHERE SLEEPING SICKNESS IS RIFE, BUT RAINY SCOTLAND HAS LONG BEEN AT THE FOREFRONT OF RESEARCH INTO SLEEPING SICKNESS.

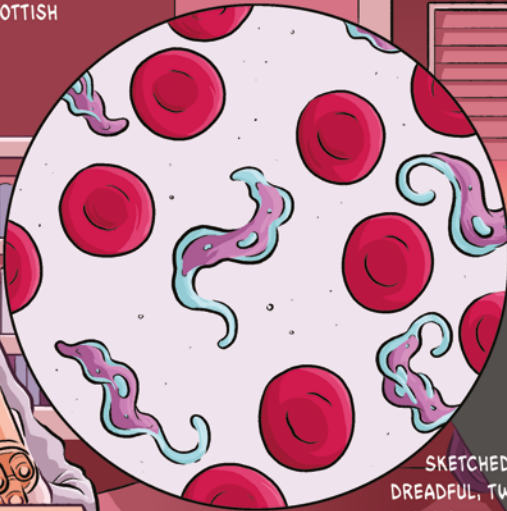
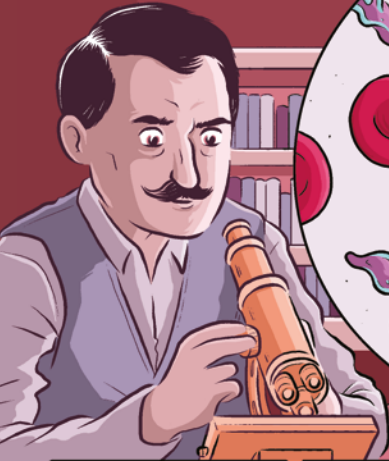


AT THE BEGINNING OF THE 20TH CENTURY, THE HEIGHT OF EUROPEAN COLONISATION, A TERRIBLE EPIDEMIC SWEEPED ACROSS SOUTHERN AFRICA.

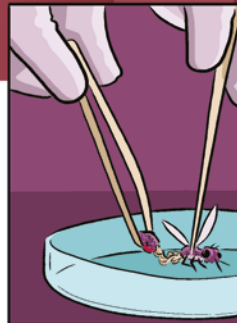
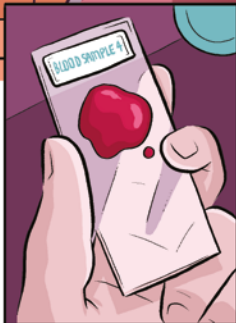


WITH A QUARTER OF A MILLION PEOPLE DEAD, A MASSIVE INVESTIGATION WAS SOON UNDERWAY TO UNDERSTAND THIS AWFUL ILLNESS.

WITH SAMPLES OF BLOOD ILLUMINATED UNDER HIS MICROSCOPE, SCOTTISH MEDIC DR DAVID BRUCE SAW THE CAUSE.



SKETCHED OUT BY HIS WIFE MARY, THE DREADFUL, TWISTED PARASITES CAUSING THE SICKNESS WERE FINALLY REVEALED.



BEFORE LONG, A NETWORK OF SCIENTIFIC COLLABORATORS IN SCOTLAND AND BEYOND BEGAN TO UNRAVEL THE MYSTERIES OF THIS DEADLY DISEASE.

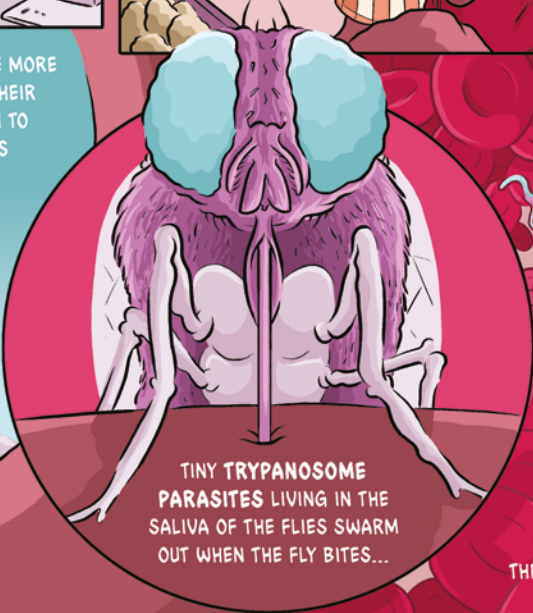


HOW COULD SOMETHING SO TINY CAUSE SO MUCH MISERY?



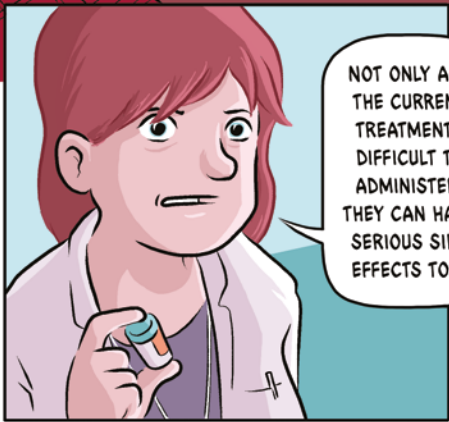
IN REGIONS OF SUB-SAHARAN AFRICA, BITING TSETSE FLIES BUZZ THROUGH THE AIR ALL DAY LONG.

SOME OF THESE FLIES ARE MORE THAN JUST A NUISANCE. THEIR BITE CAN BE DEADLY BOTH TO HUMANS AND THE ANIMALS THEY DEPEND ON.



TINY TRYPANOSOME PARASITES LIVING IN THE SALIVA OF THE FLIES SWARM OUT WHEN THE FLY BITES...

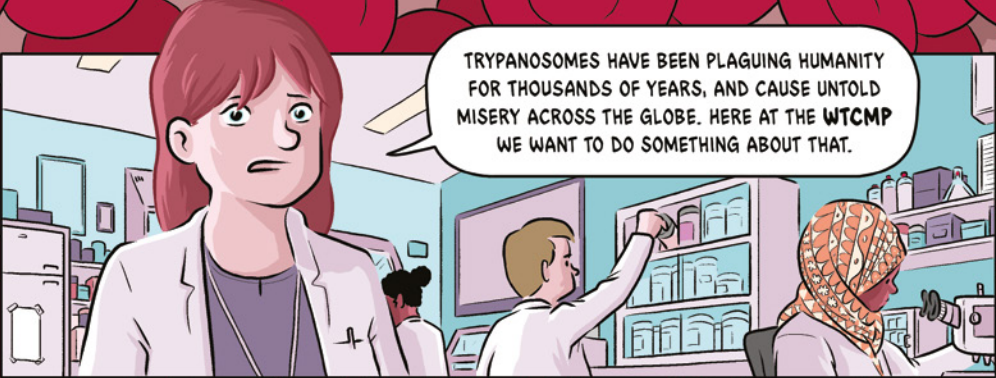
...AND ONCE THESE PARASITES ARE UNDER THE SKIN THEY'RE REALLY HARD TO GET RID OF.



NOT ONLY ARE THE CURRENT TREATMENTS DIFFICULT TO ADMINISTER, THEY CAN HAVE SERIOUS SIDE EFFECTS TOO.

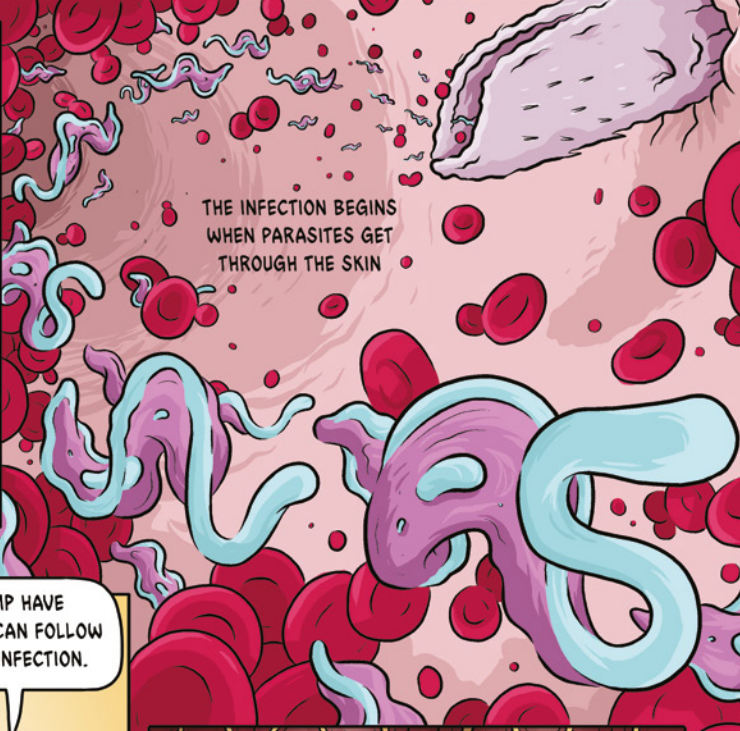


ADDED TO THAT THE FACT THAT TRYPANOSOMES ARE MASTERS AT EVADING OUR IMMUNE SYSTEM, AND YOU'VE GOT ONE TOUGH PARASITE ON YOUR HANDS!




TRYPANOSOMES HAVE BEEN PLAGUING HUMANITY FOR THOUSANDS OF YEARS, AND CAUSE UNTOLD MISERY ACROSS THE GLOBE. HERE AT THE WTCMP WE WANT TO DO SOMETHING ABOUT THAT.

BY UNDERSTANDING HOW TRYPANOSOMES INFECT HUMANS AND ANIMALS, WE HOPE TO FIND NEW WAYS TO STOP THEM.



THE INFECTION BEGINS WHEN PARASITES GET THROUGH THE SKIN



RESEARCHERS AT THE WTCMP HAVE PIONEERED TECHNIQUES SO WE CAN FOLLOW INDIVIDUAL PARASITES AFTER INFECTION.



TAGGED WITH A FLUORESCENT DYE, WE CAN WATCH AS THEY SQUIRM UNDER THE SKIN AND FOLLOW THEM AS THEY PLOUGH THEIR DESTRUCTIVE PATH.

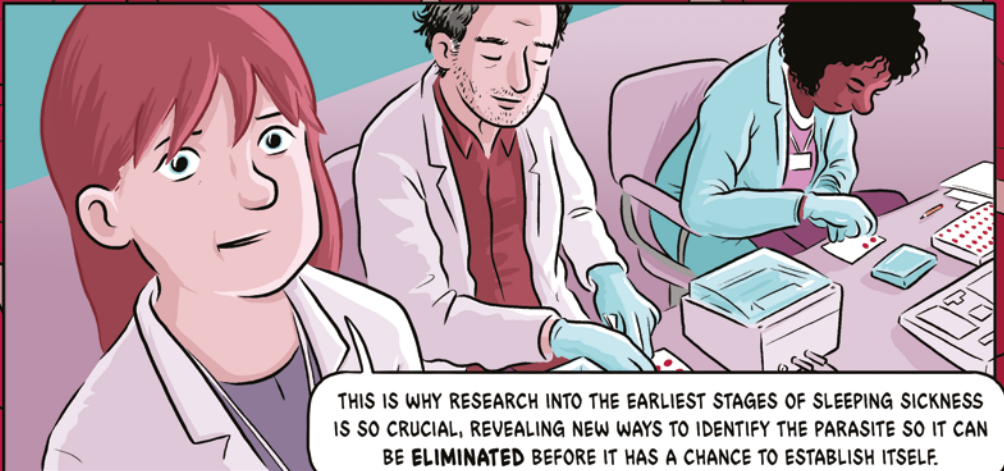
OUR RESULTS SHOW THAT TRYPANOSOMES ARE ABLE TO SURVIVE IN THE BODY FOR A LONG TIME WITHOUT CAUSING DISEASE.



IN THE REAL WORLD THIS CAN CAUSE BIG PROBLEMS AS PEOPLE MAY **UNKNOWINGLY** CARRY AND SPREAD THE DISEASE FOR YEARS TO COME.

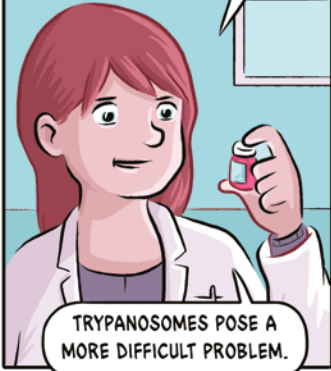


DETECTING AN INFECTION EARLY IS ONE OF THE MOST IMPORTANT PARTS OF A SPEEDY RECOVERY, BUT TRYPANOSOMES CAN BE HARD TO FIND, AND THE SYMPTOMS OF SLEEPING SICKNESS ARE OFTEN MISTAKEN FOR OTHER DISEASES.



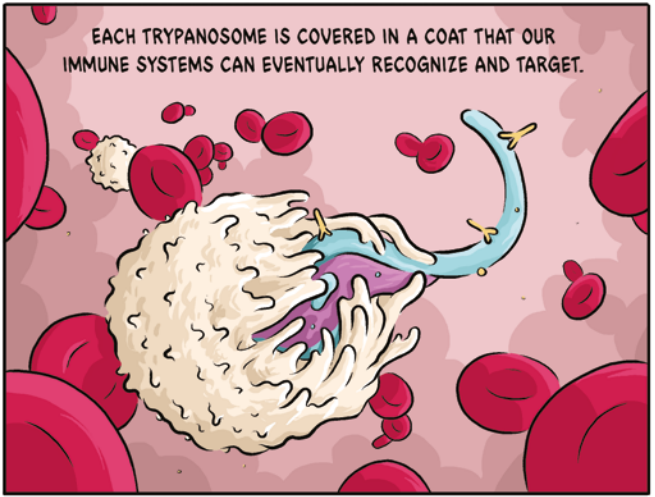
THIS IS WHY RESEARCH INTO THE EARLIEST STAGES OF SLEEPING SICKNESS IS SO CRUCIAL, REVEALING NEW WAYS TO IDENTIFY THE PARASITE SO IT CAN BE **ELIMINATED** BEFORE IT HAS A CHANCE TO ESTABLISH ITSELF.

FOR MANY DISEASES, LIKE MEASLES, WE CAN USE VACCINES WHICH PRIME OUR IMMUNE SYSTEMS TO **FIGHT BACK**.

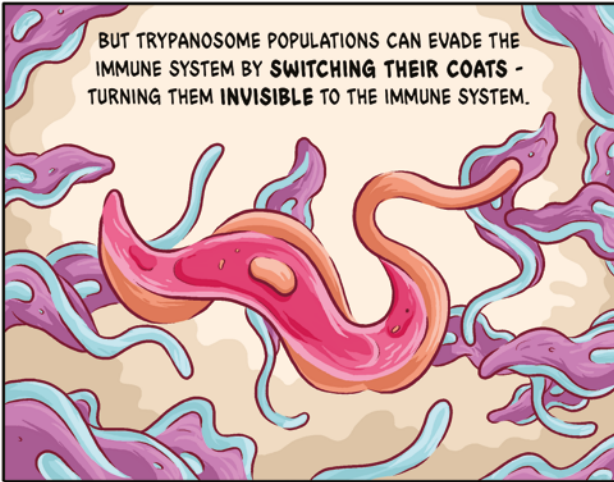


TRYPANOSOMES POSE A MORE DIFFICULT PROBLEM.

EACH TRYPANOSOME IS COVERED IN A COAT THAT OUR IMMUNE SYSTEMS CAN EVENTUALLY RECOGNIZE AND TARGET.



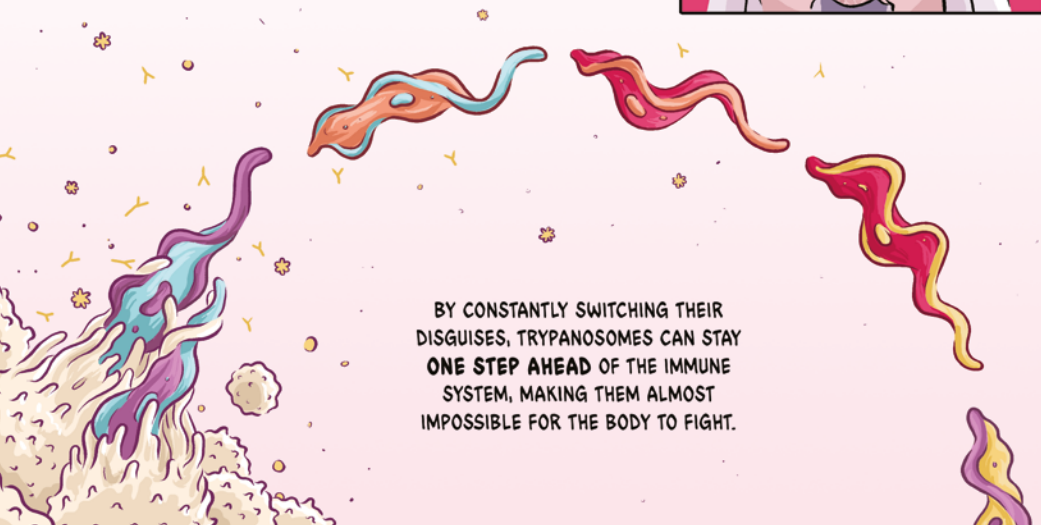
BUT TRYPANOSOME POPULATIONS CAN EVADE THE IMMUNE SYSTEM BY **SWITCHING THEIR COATS** - TURNING THEM **INVISIBLE** TO THE IMMUNE SYSTEM.

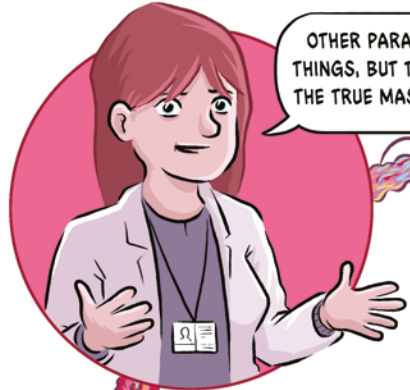


THESE NEW DISGUISES ALLOW THEM TO ESCAPE AND CONTINUE THE INFECTION. THOSE THAT HAVEN'T CHANGED ARE CAUGHT AND DESTROYED, THEIR COVER BLOWN!



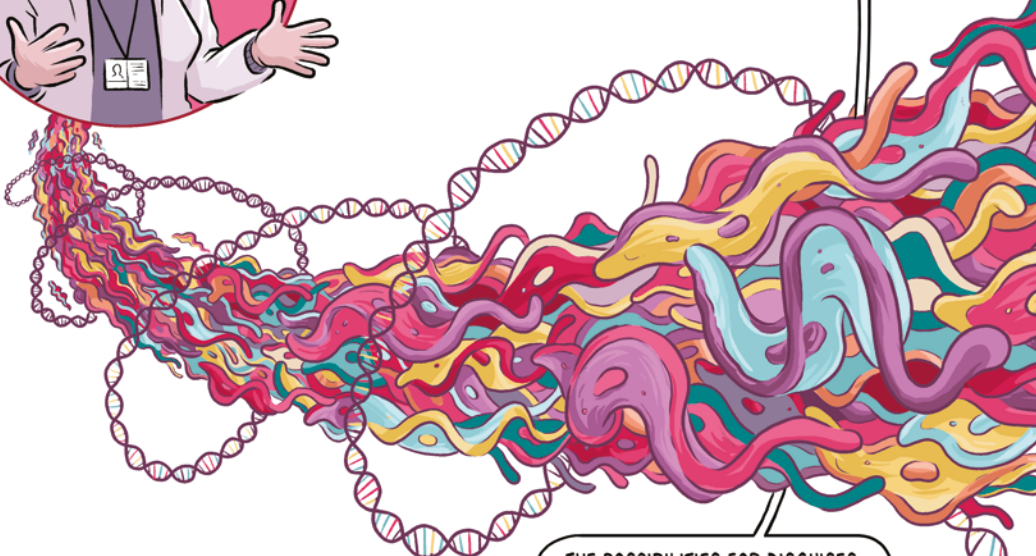
BY CONSTANTLY SWITCHING THEIR DISGUISES, TRYPANOSOMES CAN STAY **ONE STEP AHEAD** OF THE IMMUNE SYSTEM, MAKING THEM ALMOST IMPOSSIBLE FOR THE BODY TO FIGHT.





OTHER PARASITES DO SIMILAR THINGS, BUT TRYPANOSOMES ARE THE TRUE MASTERS OF DISGUISE.

RESEARCH AT THE WTCMP HAS SHOWN THAT THEY HAVE ALMOST 1000 DIFFERENT COAT GENES IN THEIR GENOMES. AND WHAT'S MORE, THEY CAN FUSE THEM TOGETHER TO MAKE **NEW COMBINATIONS**.



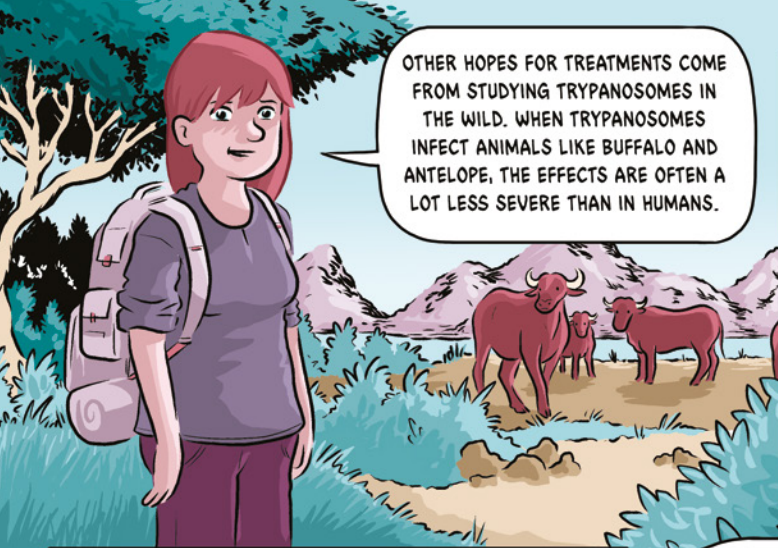
THE POSSIBILITIES FOR DISGUISES ARE VIRTUALLY ENDLESS!

ALL THIS MAKES HOPE FOR A VACCINE SCARCE. BUT RESEARCHERS AT THE WTCMP ARE WORKING OUT JUST HOW THESE PARASITES SWITCH THEIR DISGUISES AT THE MOLECULAR LEVEL.



IF WE COULD STOP THEM FROM SWITCHING DISGUISES WE COULD TRAP THEM IN ONE COAT, GIVING THE IMMUNE SYSTEM A CHANCE TO CATCH UP AND WIPE THEM OUT.

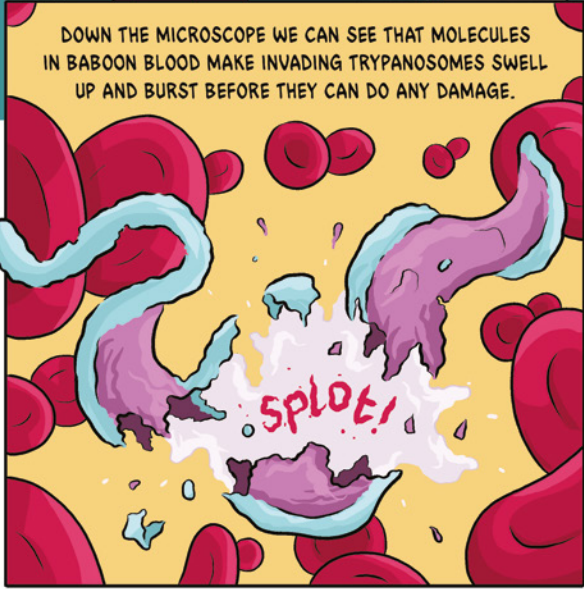




OTHER HOPES FOR TREATMENTS COME FROM STUDYING TRYPANOSOMES IN THE WILD. WHEN TRYPANOSOMES INFECT ANIMALS LIKE BUFFALO AND ANTELOPE, THE EFFECTS ARE OFTEN A LOT LESS SEVERE THAN IN HUMANS.



BABOONS ARE PARTICULARLY RESISTANT TO INFECTION.



DOWN THE MICROSCOPE WE CAN SEE THAT MOLECULES IN BABOON BLOOD MAKE INVADING TRYPANOSOMES SWELL UP AND BURST BEFORE THEY CAN DO ANY DAMAGE.

SPLAT!



ALTHOUGH HUMANS HAVE A SIMILAR LINE OF DEFENCE, IT IS NOT AS POWERFUL AS BABOONS' DEFENCES AND THE TRYPANOSOMES THAT CAUSE SLEEPING SICKNESS AREN'T AFFECTED BY IT.



RESEARCHERS AT THE WTCMP ARE HARD AT WORK STUDYING THESE DEFENCES. BY FIGURING OUT WHY BABOONS CAN DO WHAT HUMANS CAN'T WE MIGHT BE ABLE TO HARNESS THIS TRYPANOSOME-BURSTING POWER FOR NEW TREATMENTS.

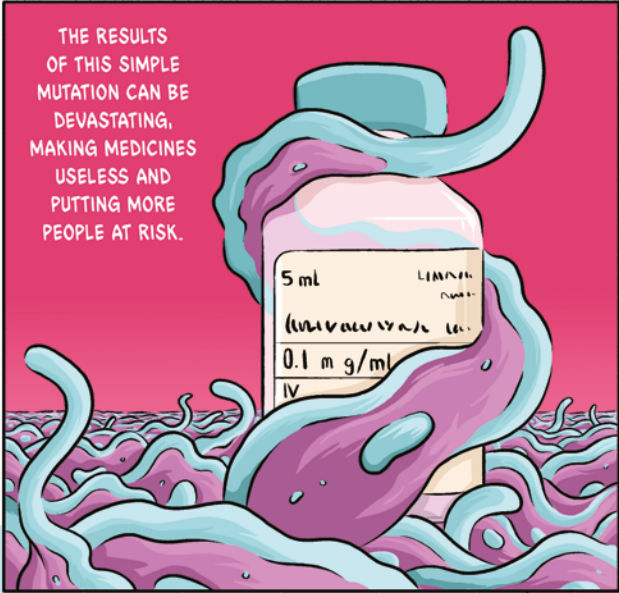




WHILE WE GRADUALLY WORK TOWARDS NEW TREATMENTS, EVOLUTION BY NATURAL SELECTION MEANS THAT TRYPANOSOMES ARE BECOMING **RESISTANT** TO THE FEW MEDICINES THAT WE DO HAVE.



MY COLLEAGUES HERE AT THE WTCMP DISCOVERED THAT TRYPANOSOMES CAN BECOME RESISTANT TO ONE OF OUR FRONT-LINE MEDICATIONS BY A MUTATION IN A SINGLE GENE.



THE RESULTS OF THIS SIMPLE MUTATION CAN BE DEVASTATING, MAKING MEDICINES USELESS AND PUTTING MORE PEOPLE AT RISK.



THE TRUTH IS THAT INFECTIOUS DISEASE IS A MOVING TARGET, AND TRYPANOSOMES ARE CONSTANTLY EVOLVING AND ACQUIRING MUTATIONS.

IF WE ARE EVER TO GET THE UPPER-HAND ON SLEEPING SICKNESS, IT'S CRUCIAL THAT WE UNDERSTAND HOW THESE PARASITES **EVOLVE**, AND HOW DRUG RESISTANCE DEVELOPS AND SPREADS.



WATCHING THEM SWARM ACROSS MY MICROSCOPE SLIDE, I THINK HOW STRANGE TRYPANOSOMES ARE.

SEPARATED FROM US BY OVER A BILLION YEARS OF EVOLUTION, AT TIMES THEY SEEM ALMOST ALIEN.

TRYPANOSOMES CAN TEACH US A LOT ABOUT THE FUNDAMENTALS OF BIOLOGY AS WELL AS THE HISTORY AND DIVERSITY OF LIFE ON EARTH.



TRYPANOSOMES ARE A RESILIENT ENEMY. WHILE THE NUMBER OF CASES OF SLEEPING SICKNESS SEEMS TO BE FALLING, WE STILL HAVE OUR WORK CUT OUT TO DEFEAT IT.



THEY ARE REMARKABLE CREATURES. BUT IT'S HARD TO ADMIRE THEM, KNOWING ALL THE SUFFERING THEY CAUSE.



RESEARCH GIVES US THE KNOWLEDGE WE NEED TO DEVELOP NEW WEAPONS TO DETECT AND FIGHT THE PARASITE.



THE DREAM IS THAT ONE DAY WE'LL END THE NIGHTMARE OF SLEEPING SICKNESS FOR GOOD.

THE **WELLCOME TRUST CENTRE FOR MOLECULAR PARASITOLOGY** IS BASED AT THE UNIVERSITY OF GLASGOW. OUR MISSION IS TO DEVELOP A DEEPER UNDERSTANDING OF MOLECULAR PROCESSES AND PATHWAYS IN PARASITES IN ORDER TO DEVELOP NEW APPROACHES TO TREATMENT.

FOR MORE INFORMATION ABOUT OUR WORK PLEASE VISIT:
WWW.GLA.AC.UK/RESEARCHINSTITUTES/III/WTCMP/

OR CHAT WITH US @WTCMPGLASGOW ON TWITTER.

WITH THANKS TO DR. ANNETTE MACLEOD, VICKIE CURTIS, AND ALL OF OUR PROOFREADERS FOR THEIR HELP IN MAKING THIS BOOKLET.

FOR MORE FROM ARTIST EDWARD ROSS VISIT: WWW.EDWARDROSS.CO.UK



University
of Glasgow

Wellcome Trust
Centre for Molecular
Parasitology

Supported by
wellcometrust

SLEEPING SICKNESS IS A TERRIBLE DISEASE THAT AFFECTS MILLIONS OF LIVES. IT IS CAUSED BY A **NIGHTMARISH PARASITE** CAPABLE OF DISGUISSING ITSELF FROM THE IMMUNE SYSTEM AND HIDING UNDETECTED IN THE BODY.

ACROSS THE GLOBE, SCIENTISTS ARE BATTLING THIS MICROSCOPIC FOE IN AN **ONGOING SEARCH** FOR TREATMENT AND A CURE.



University
of Glasgow

Wellcome Trust
Centre for Molecular
Parasitology

Supported by

wellcometrust