

SCIENCE SPAZA

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NANOMEDICINE - TINY PARTICLES. BIG PROGRESS

POOR UNCLE! THEY SAY HE HAS TUBERCULOSIS!

THAT EXPLAINS HIS COUGHING, NIGHT SWEATS AND WEIGHT LOSS. AT LEAST NOW THEY CAN START TO TREAT HIM.

DOESN'T TB TREATMENT TAKE A LONG TIME?

YES, AND HE MUST TAKE HIS PILLS EVERY DAY FOR THEM TO WORK!

LUCKILY THERE ARE SOME BIG CHANGES AHEAD - ALL BECAUSE OF SOME VERY SMALL PARTICLES...

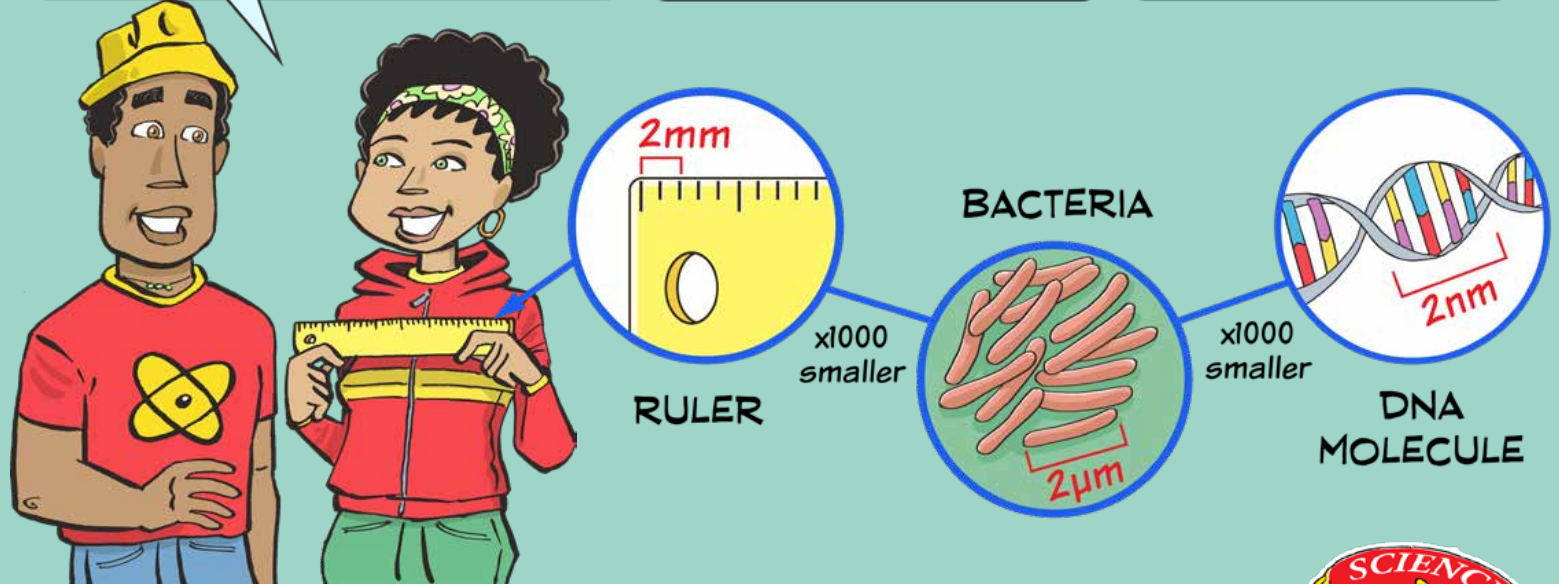
BIG... SMALL...? WHAT?

INTRO TO NANOMEDICINE

NANOMEDICINE USES REALLY SMALL MATERIALS (NANOPARTICLES) TO HELP PEOPLE FEEL BETTER AND STAY HEALTHY.

NANOPARTICLES ARE EXTREMELY SMALL - BETWEEN 1 AND 100 NANOMETERS.

THERE ARE A MILLION NANOMETRES (NM) IN A MILLIMETRE (MM).



Knowledge is NCAW!



LINK IT UP!

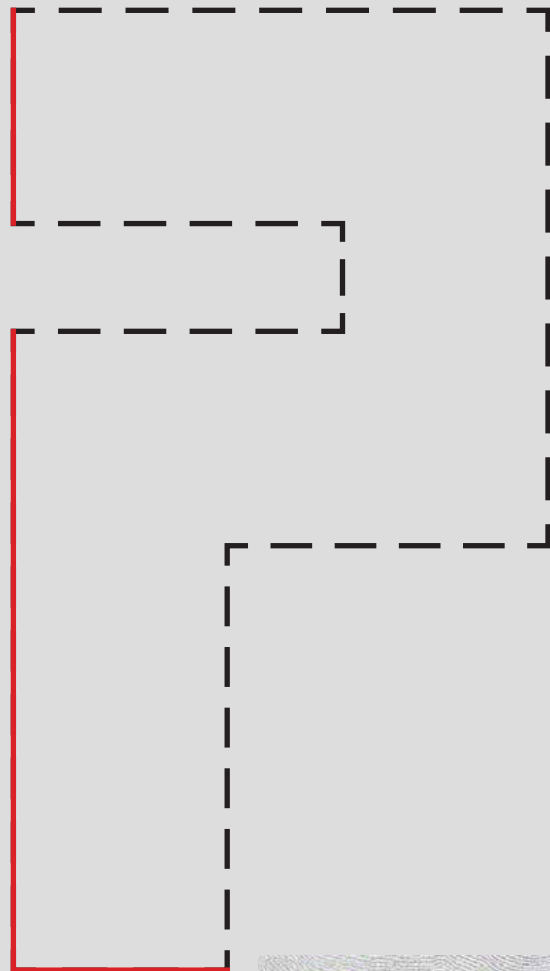
LET'S LEARN ABOUT **POLYMERS**, ONE OF THE MANY TYPES OF MATERIALS USED TO MAKE NANOPARTICLES, BY MAKING A PAPER CHAIN.

YOU WILL NEED:

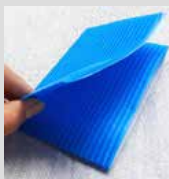
- WHITE PAPER TO TRACE THE OUTLINE OF THE TEMPLATE SHAPE
- SCRAP PAPER, NEWSPAPER OR GIFT WRAP
- RULER
- PEN OR PENCIL
- A PAIR OF SCISSORS



1 COVER THIS PAGE WITH A PIECE OF WHITE PAPER AND TRACE THE OUTLINE OF THE TEMPLATE BELOW. HOLD THE PAGE UP TO A WINDOW WHILE TRACING TO SEE BETTER. CUT OUT THE SHAPE. THIS WILL BE YOUR TEMPLATE.



2 CUT YOUR SCRAP PAPER INTO A5 RECTANGLES. THAT'S ABOUT 15 CM X 21 CM. FOLD THE PAPER IN HALF LENGTHWISE AND THEN AGAIN IN HALF LENGTHWISE, SO IT'S FOLDED IN QUARTERS.



3 COPY YOUR TEMPLATE ONTO THE FOLDED PAPER. PLACE THE RED LINES OF YOUR TEMPLATE ON THE FOLDED SIDES OF THE PAPER. CUT ON THE DOTTED LINES.



4 CUT OUT THE TEMPLATE AND REPEAT WITH ALL YOUR PIECES OF PAPER. THE MORE UNITS YOU MAKE THE LONGER YOUR CHAIN WILL BE.



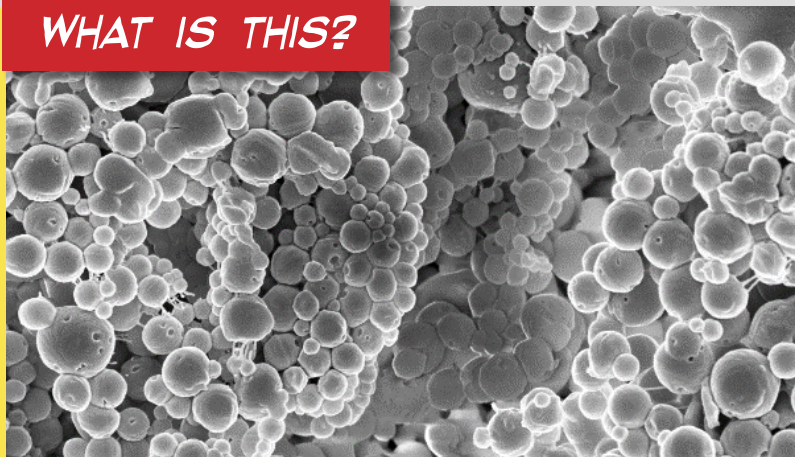
5 UNFOLD ALL UNITS. ATTACH EACH UNIT TO THE NEXT BY SLIDING ONE LAYER OF THE RECTANGLE THROUGH THE HOLE IN THE PREVIOUS UNIT AS SHOWN.



6 KEEP GOING UNTIL YOU HAVE LINKED ALL THE UNITS TOGETHER TO MAKE YOUR PAPER CHAIN.



WHAT IS THIS?



POLYMERS ARE CHAIN MOLECULES THAT FORM WHEN MANY UNITS, CALLED **MONOMERS**, LINK UP IN A **CHEMICAL REACTION**. YOUR PAPER CHAIN UNITS ARE LIKE MONOMERS THAT FORMED A POLYMER WHEN YOU CONNECTED THEM. MANY THINGS LIKE **PLASTIC**, **PAINT** AND EVEN **PHARMACEUTICALS** ARE MADE FROM POLYMERS.

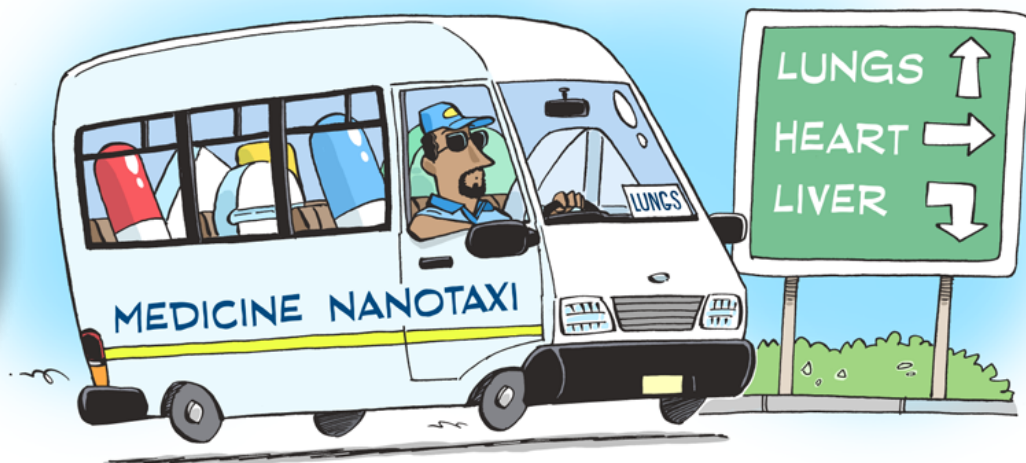
A scanning electron microscope image of polymer nanoparticles loaded with a drug for the treatment of TB.



TREATING TB USING NANOMEDICINE



Mycobacterium tuberculosis



THE **BACTERIA** THAT CAUSE TB INFECT LUNGS AND OTHER ORGANS OF PATIENTS. UNFORTUNATELY, EXISTING MEDICINE HAS **SIDE EFFECTS** AND DOES NOT ALWAYS KILL THESE BACTERIA.

Researchers use nanoparticles to improve TB medicine delivery. Just like a taxi takes passengers to school, work or town, nanoparticles made from polymers can take the medicine directly to target organs and release it slowly. This makes the medicine more effective in killing bacteria and patients will have to take less medicine, less often.

BETTER TB TREATMENT

RETSEPILE EPHRAIM MAPHASA IS A PHD CANDIDATE IN THE INFECTIOUS DISEASE NANOMEDICINE (IDNM) LAB, AT THE SCHOOL OF PHARMACY, UNIVERSITY OF THE WESTERN CAPE.

HE IS CONDUCTING RESEARCH TO DEVELOP IMMUNOTHERAPEUTIC NANOPARTICLES FOR THE TREATMENT OF TUBERCULOSIS. HE:

- STUDIED MATHS AND SCIENCE AT FEZEKA SECONDARY SCHOOL IN GUGULETHU.
- STUDIED BSC BIOTECHNOLOGY AT THE UNIVERSITY OF THE WESTERN CAPE.
- STUDIED MSC NANOSCIENCE AT THE UNIVERSITY OF THE WESTERN CAPE.
- CURRENTLY A PHD CANDIDATE IN PHARMACEUTICAL SCIENCES AT THE UNIVERSITY OF THE WESTERN CAPE.



CURRICULUM LINKS

- *Gr 5 and 7 Life Skills:*
Common diseases -
Tuberculosis
- *Grade 12 Physical Science:*
Organic macromolecules -
Polymers

WORD SEARCH

HOW MANY OF THE WORDS ON THE LIST CAN YOU FIND?

- LUNGS
- BACTERIA
- TUBERCULOSIS
- NANOPARTICLES
- MEDICINE
- DELIVERY
- POLYMER
- MICROSCOPY
- TARGET
- TREATMENT
- LIPOSOME
- PULMONARY



THE WORDS IN THE GRID RUN HORIZONTALLY, VERTICALLY AND DIAGONALLY, FORWARDS OR BACKWARDS SO LOOK CAREFULLY!

A	D	G	T	T	H	J	K	I	K	L	O	B	T
T	A	R	G	E	T	F	R	C	X	V	B	M	R
U	S	Z	Q	V	O	B	M	P	O	P	H	U	E
B	A	C	T	E	R	I	A	L	O	L	B	D	A
E	D	O	C	T	O	R	H	L	T	E	A	E	T
R	P	M	Z	C	A	U	Y	B	N	U	T	L	M
C	M	Y	A	E	B	M	G	O	L	D	V	I	E
U	F	I	N	D	E	P	E	B	E	V	H	V	N
L	F	S	Y	R	I	O	N	D	O	U	J	E	T
O	U	G	N	K	U	H	Q	J	I	I	M	R	P
S	Y	N	M	O	I	U	T	U	L	C	K	Y	O
I	B	U	P	M	B	G	Y	R	M	M	I	M	X
S	E	L	C	I	T	R	A	P	O	N	A	N	M
L	O	P	U	A	M	S	V	M	W	Q	R	F	E

START YOUR OWN SCIENCE SPAZA

Do you want to start a science club at your school? Send us the following information, and Science Spaza will contact you.

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Name: _____

Telephone number: _____

Email address: _____

Physical address: _____

Visit www.sciencespaza.org, email info@sciencespaza.org, SMS or WhatsApp us on 076 173 7130 or write to us at PO Box 22106, Mayor's Walk, 3208.

WE WANT YOUR FEEDBACK!

DID YOU ENJOY LEARNING ABOUT NANOMEDICINE? LET US KNOW - SEND US A PICTURE OF YOUR PAPER CHAIN! VISIT OUR SCIENCE SPAZA PAGE ON FACEBOOK, OR WHATSAPP US YOUR PICTURES ON 076 173 7130.



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