

Launch  
Hair and Skin Lab  
29<sup>th</sup> May 2015

Nonhlanhla P Khumalo

MBChB, FCDerm, PhD

Division of Dermatology  
Groote Schuur Hospital  
And University of Cape Town

# Side effects from contact with chemicals?

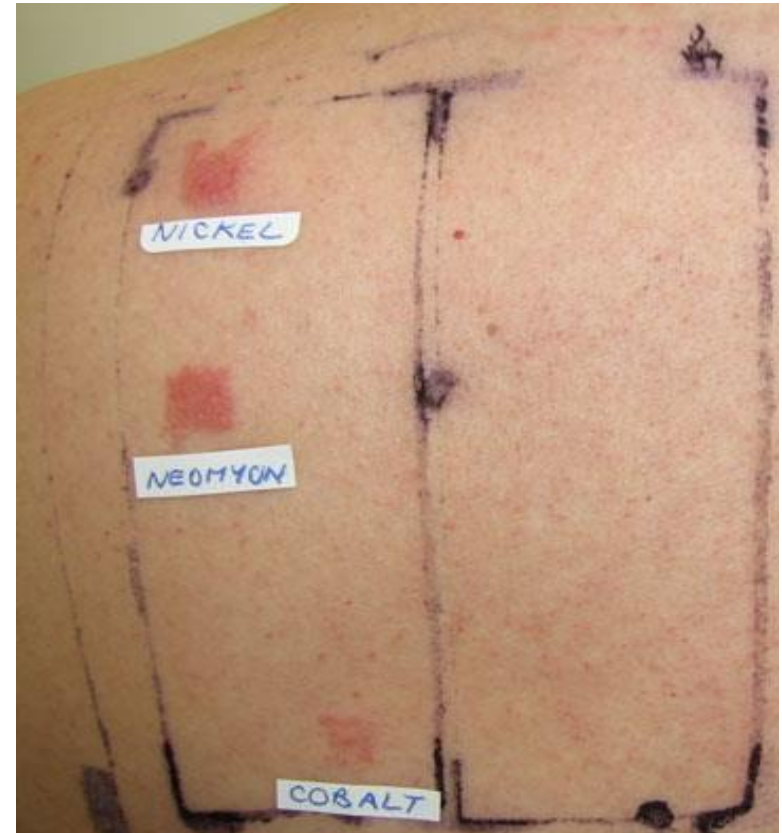
(from a cream applied to the face, or products used at work)



- Prevalence  
16.4% - 80%
- Highest  
Hairdressers

Khumalo *et al* adverse effects of hairdressing: a systematic review. *Arch Dermatol* 2006

Dermatologists try to identify the cause  
Allergy 'Patch' Tests



and advice:  
avoid offending agent  
treat (steroid creams, phototherapy)

# Adverse effects: two sides of a coin

## Allergic reaction

- Unpredictable
- Can't avoid  
(initial reaction)

## Toxic reactions

- Predictable effects
- Can/must be avoid

# Reasons for changing skin colour

Remove/fade blemishes, brighten, clarify, lighten, whiten normal skin

Unintended consequences



Offending ingredients are illegal in SA yet widely available...

- Steroids
- Mercury
- Hydroquinone

# Popular skin lightening creams on the SA market

Experimental dermatology • Original article

CED  
Clinical and Experimental Dermatology

Combinations of potent topical steroids, mercury and hydroquinone are common in internationally manufactured skin-lightening products: a spectroscopic study

M. H. Maneli,<sup>1</sup> L. Wiesner,<sup>2</sup> C. Tinguely,<sup>3</sup> L. M. Davids,<sup>4</sup> Z. Spengane,<sup>1</sup> P. Smith,<sup>2</sup> J. C. van Wyk,<sup>1</sup> A. Jardine<sup>5</sup> and N. P. Khumalo<sup>1</sup>

<sup>1</sup>Divisions of Dermatology and <sup>2</sup>Clinical Pharmacology, Groote Schuur Hospital, Cape Town, South Africa; and Departments of <sup>3</sup>Geological Sciences, <sup>4</sup>Human Biology and <sup>5</sup>Chemistry, University of Cape Town, Cape Town, South Africa

products contained steroids - 2 steroids, mercury and hydroquinone often in combinations

Study in press...

# All Hair Loss is devastating



But scarring hair loss is worse...

In auto-immune alopecia areata - chance of regrowth...



Contact irritant therapy

02/02/2010

26/08/2011



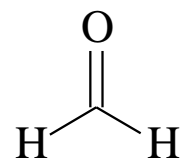
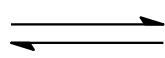
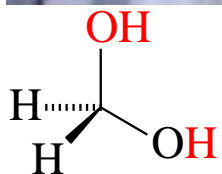
# Hair straightener (relaxer) sold without neutralizing shampoo



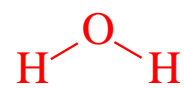
Little girl with scarring  
**permanent** hair loss that  
is completely  
**preventable...**

“Brazilian keratin treatments” for water resistant straight hair up to 3months!

What about “formaldehyde free” labels?



+



Methylene Glycol/Formalin

Formaldehyde

Water

# **Elevated formaldehyde concentration in “Brazilian keratin type” hair-straightening products: A cross-sectional study**

Mbulelo H. Maneli, PhD,<sup>a</sup> Peter Smith, PhD,<sup>b</sup> and Nonhlanhla P. Khumalo, FCDerm, PhD<sup>a</sup>  
*Cape Town, South Africa*

- Regulated at a maximum of 0.2% in cosmetics
- 6 of 7 consumer brands had formaldehyde concentration 5X the legal limit - 5 were labelled: “formaldehyde-free”

*J Amer Acad Dermatol 2013*

# Why worry?

- Cancers of blood cells

Formaldehyde exposure and leukemia: A new meta-analysis

Luoping Zhang *et al* (2009)

- Pregnancy abnormalities

Reproductive and developmental toxicity of formaldehyde:

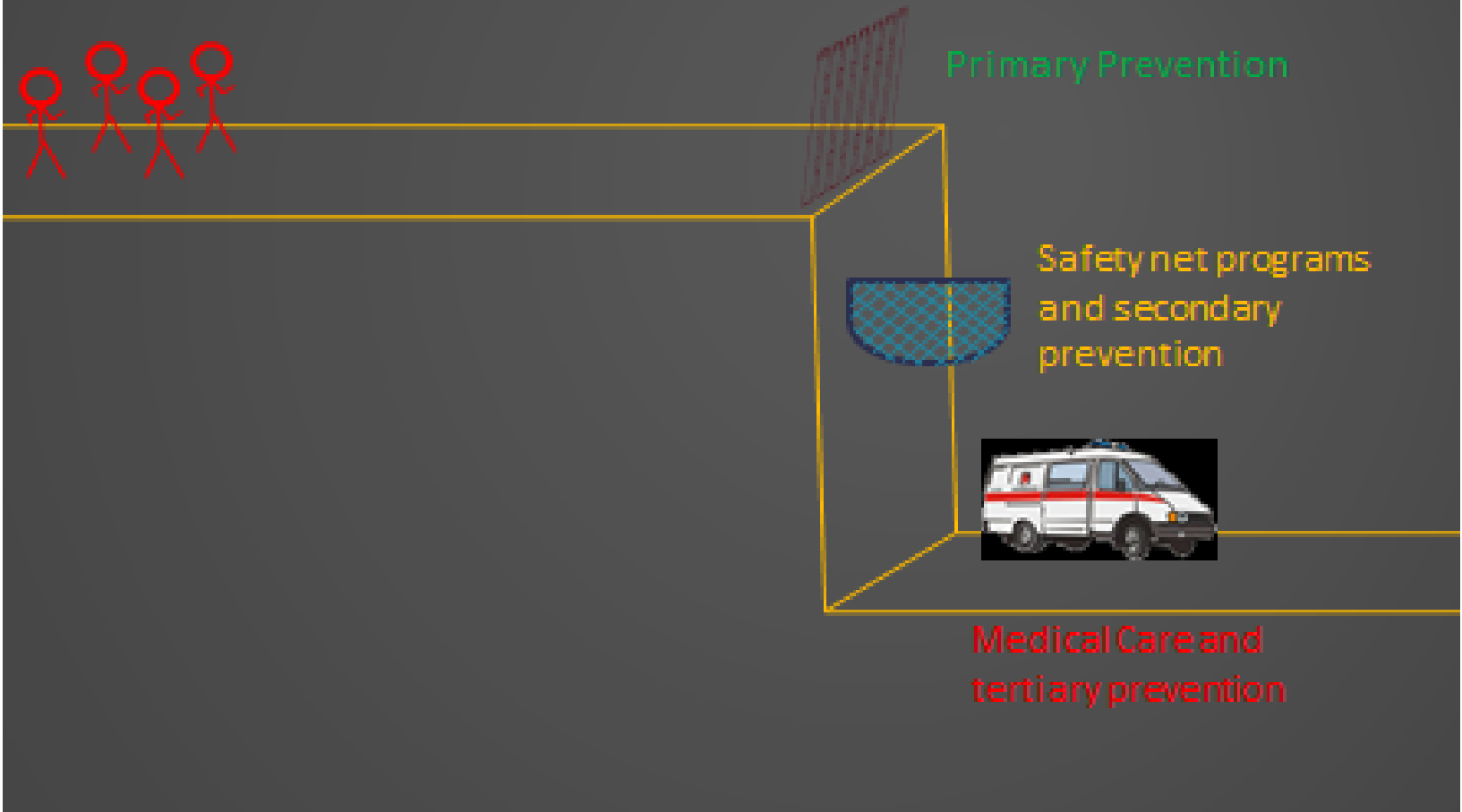
A systematic review

Anh Duong *et al* (2011)

# Example of people falling off a cliff

Social determinants of health

Current medical model



Wait for side effects to occur or try to prevent them?

# Close the gap between clinicians and scientists



- But...
- No dedicated academic department or graduate qualification in cosmetic science in the country!



# First scientist...

- Dr Mbulelo Maneli
- Begged and borrowed equipment to do our first studies



Thank you for listening and helping...



Asking for Lab space  
Prof Wendy Spearman



Learning about equipment  
Prof Pete Smith



# The 5 year journey of raising funds

## Talking to anyone who would listen...



- Has made his mission identifying talented (Maths, Accounting) and poor kids for funding to study Chartered Accountancy
- A casual chat lead to my discovery of the National Skills Fund (NSF)

Mr Lwando Bantom - SAICA

## 2<sup>nd</sup> scientist for the HSR Lab



Dr Jennifer van Wyk PhD

**Main strengths:** protein structure-function relationships  
(protein expression, purification and crystallization techniques)

**New skills:** Hair mechanical testing and analytical chemistry

**Unknown skills:** technical drawing

One tough young lady

- finalizing equipment order/installation
- validation of the formaldehyde-in-cosmetic test
- Co-supervising a new PhD student Ms Sishi

# A straight forward Lab renovation turned into a nightmare lesson in water systems



**Pre-filtration and booster pump (in corridor)**



**Geyser and Pressure pump (below)**



**Water purification, thermostatic valve, flow restrictor and eye-wash station**

Tank dirty water in roof, low pressure, cold...

# Thank you – Plumbers Contractors and Groote Schuur team



Beautiful final product...

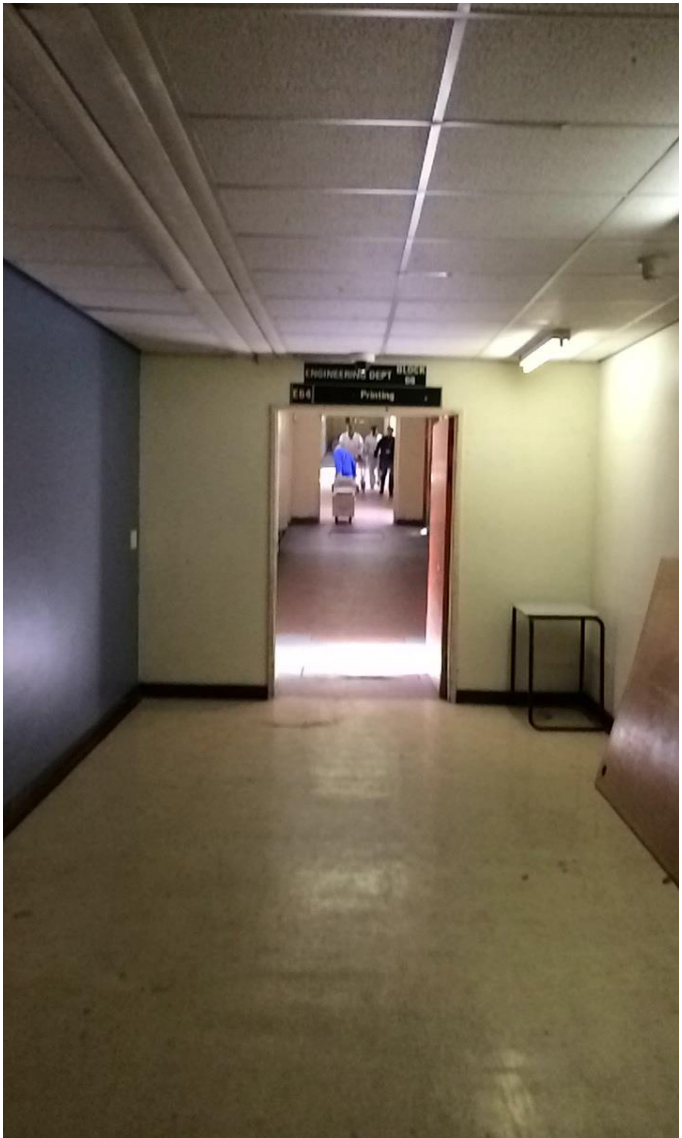
with a tap where water flows at 4l/min @37 degrees!



Lab upgrade that turned into a building site...



Would not have managed without discovering some best kept secrets, like a narrow tunnel that leads to incredible GROOTE hospital technical support skills...



1ST FLOOR		ROOM NO.
↑	PLUMBERS	21
↑	FIRE PREVENTION	11
↑	ENGINEERING ADMIN.	
↑	SIGNAGE	26
↑	AIR CONDITIONING	19
GROUND FLOOR		ROOM NO.
↑	ELECTRICAL	5
↑	PAINTERS	10
↑	CARPENTERS	19
↑	LOCKSMITH	19
↑	MECHANICAL	16

# UCT and Groote Schuur Engineering discussing technicalities of electricity, ventilation up grades...







Yaseen Parker  
UCT properties

Mr Wakefield

Martin



UCT engineering and GSH electricians

Aha!

Many technical problems solved



UCT engineering and GSH electricians

Mr Alex Apulen  
and Team

# Upholstery department



# Transformed chairs



# All hands on deck...



# Thank you GSH painters...



# The painters – revamping old furniture

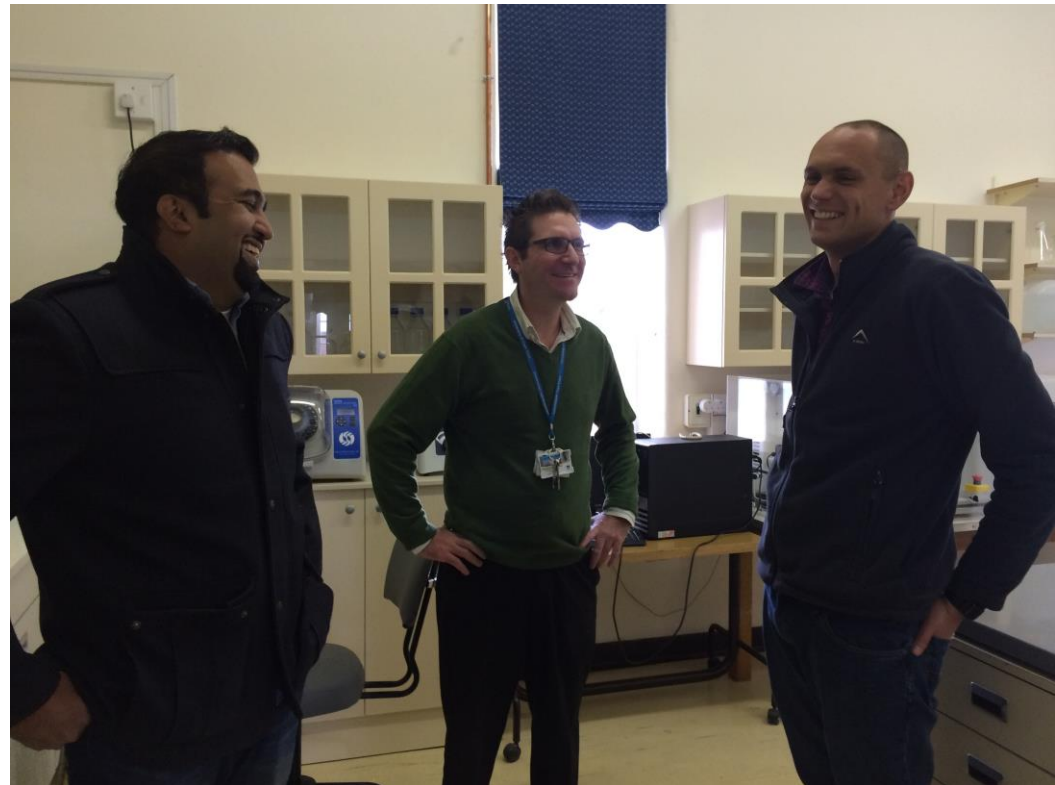




# Kind donations of furniture



From Lung infection research team...



# Improving the work environment



Malerato's Blinds



Mariskas interia

# Malerato's Blinds



# Mr Champion

Responsible for most of the paint and repair work “Mr fix-it”



# Security

---

## GSH K47 minor works

Please find attach the list of our employees who will be working on site as well as vehicle registration numbers. Could you kindly arrange for access for 25<sup>th</sup> Monday morning at job location GSH K47.

Thank you for organizing access  
and packing for contractors...



Thank you UCT Finance for managing stressful NSF audit verification meetings...

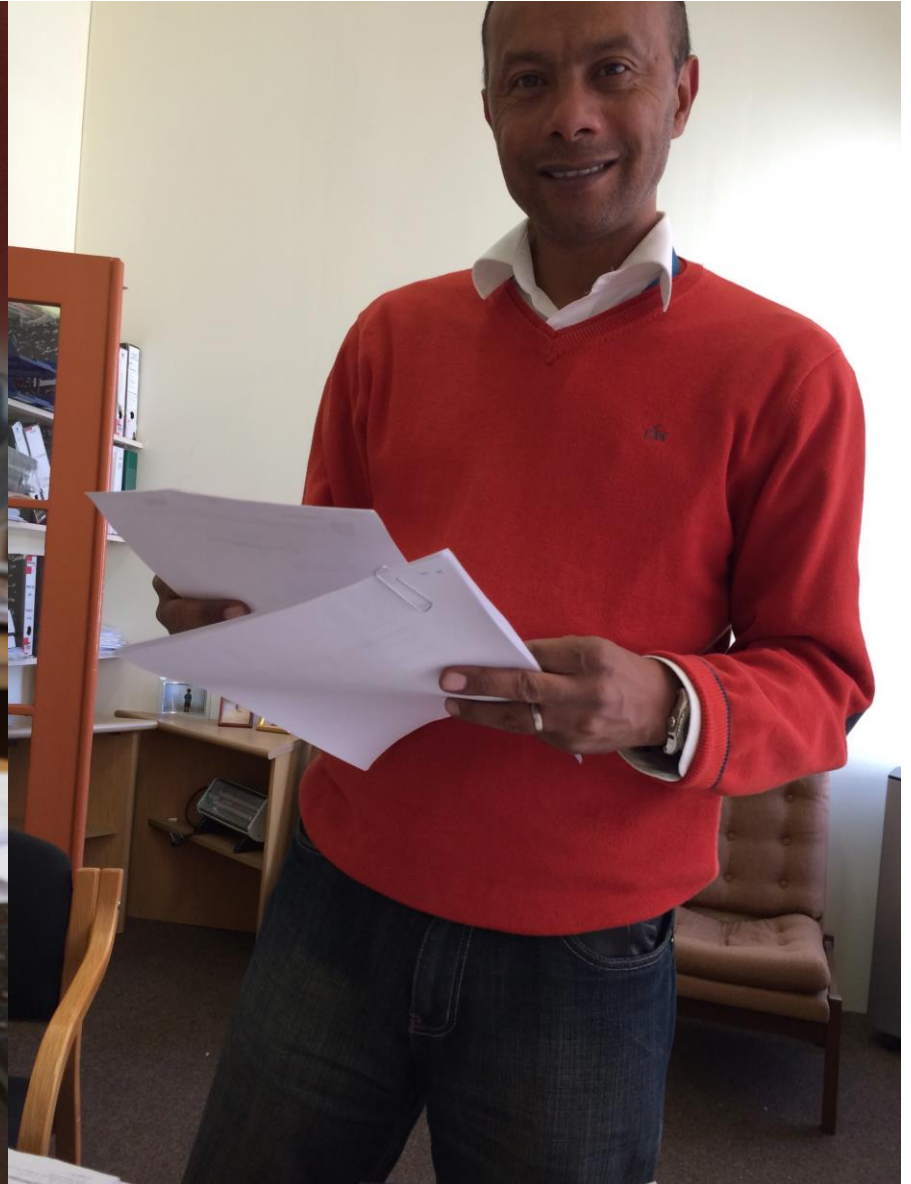


Tracey Fourie



Mr Ramawa (NSF)

Finance – Rukshana Champion would not even look at me, day before NSF audit verification...

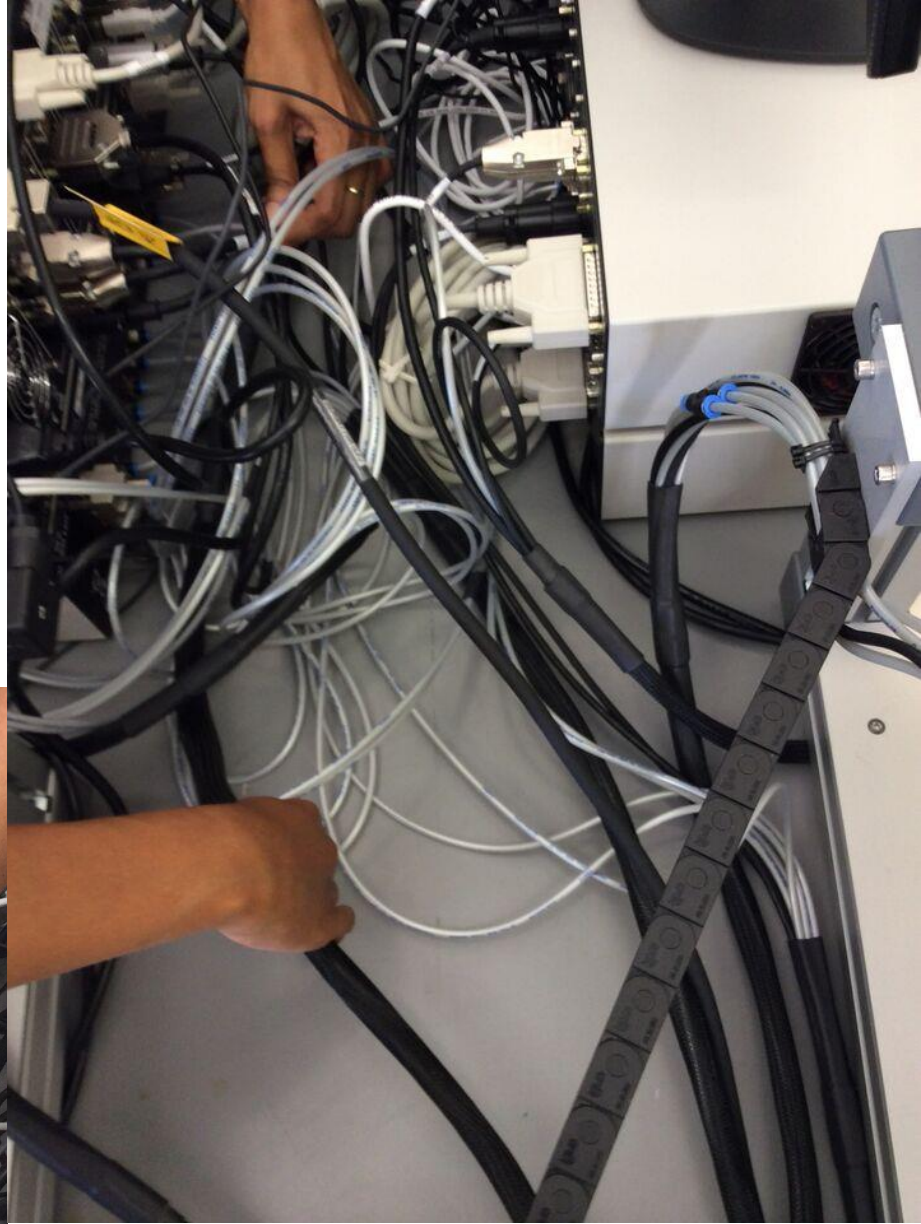
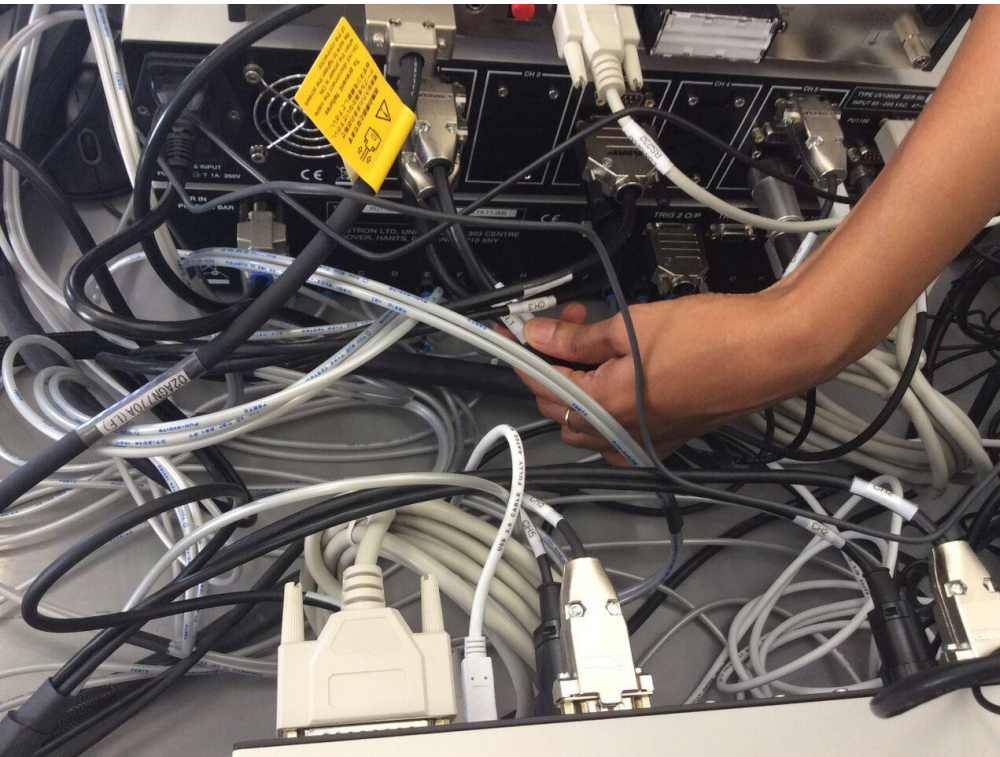


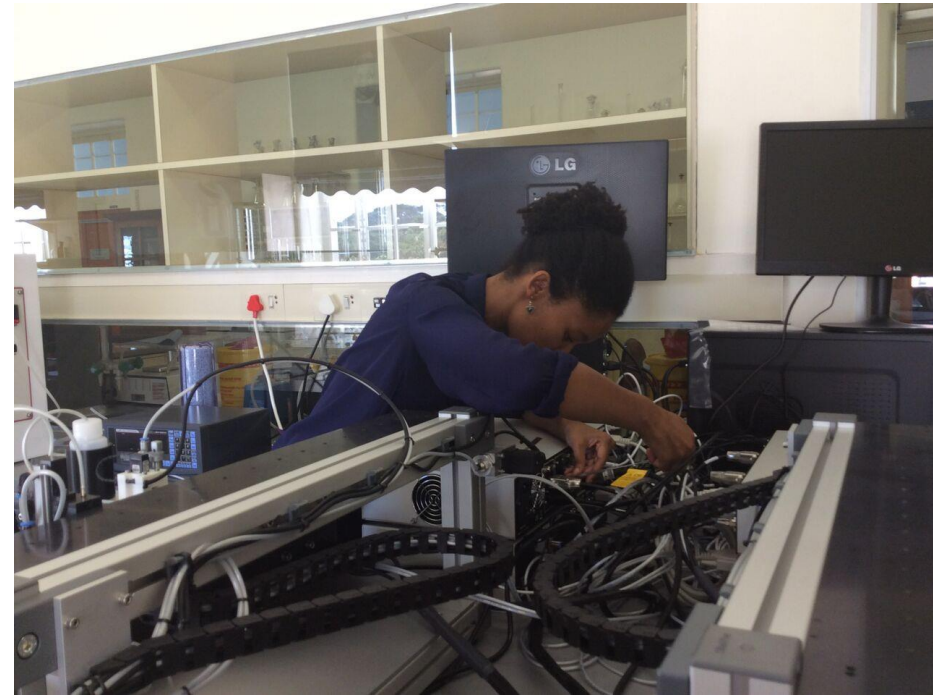
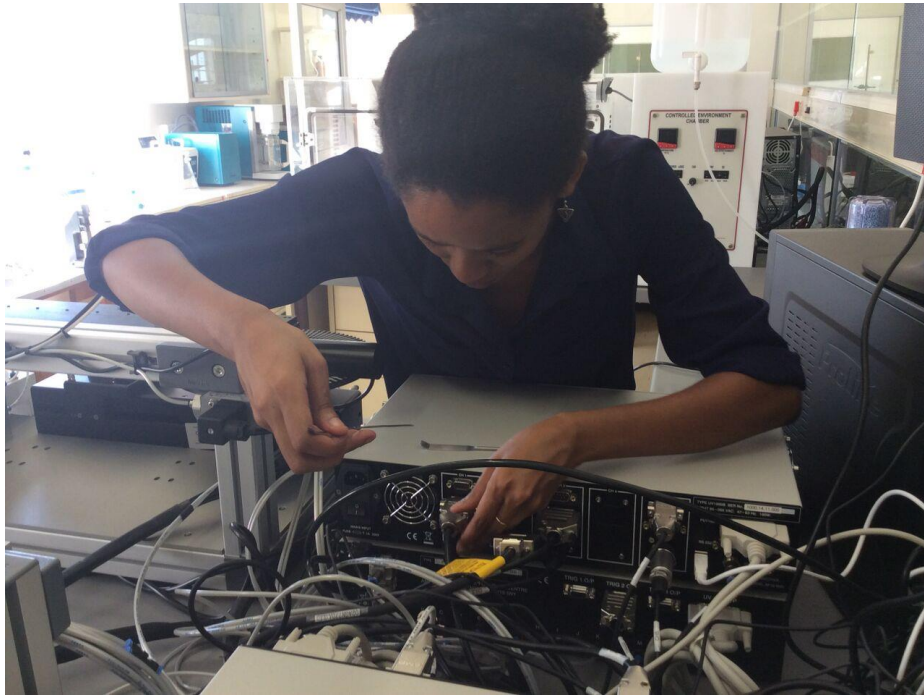
# Thanks: to Launch organizers





# Complex connections

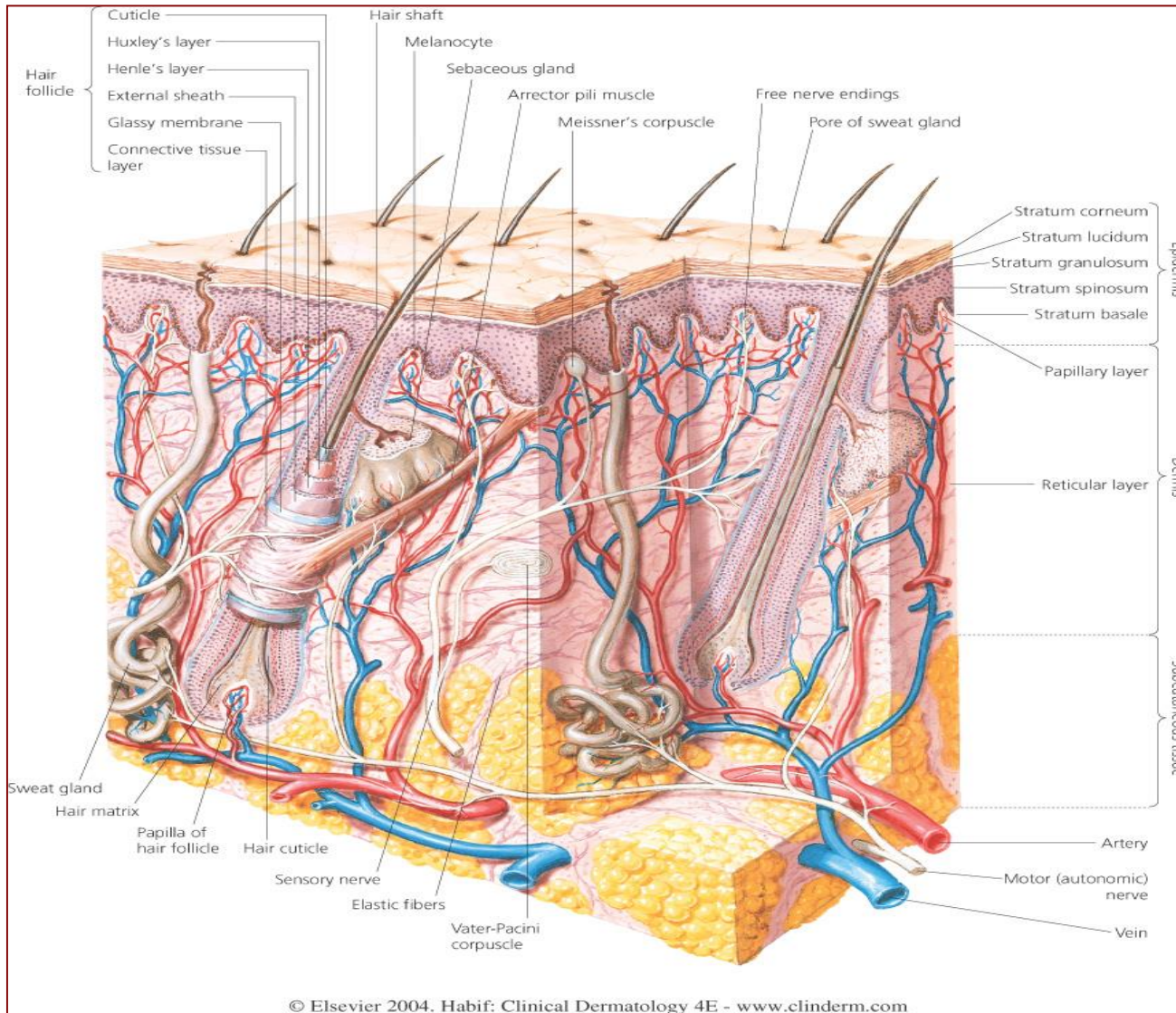




The smile of satisfaction



# Why so keen on Hair?



## ORIGINAL ARTICLE

## Elevated hair cortisol concentrations in children with adrenal insufficiency on hydrocortisone replacement therapy

G. Noppe\*†, E.F.C. van Rossum†, J. Vliegenthart\*, J.W. Kopert and E.L.T. van den Akker\*

ORIGINAL ARTICLE

Endocrine Research

## Cortisol in Hair and the Metabolic Syndrome

Tobias Stalder, Clemens Kirschbaum, Nina Alexander, Stefan R. Bornstein, Wei Gao, Robert Miller, Sabine Stark, Jos A. Bosch, and Joachim E. Fischer

## Assessment of HIV antiretroviral therapy adherence by measuring drug concentrations in hair among children in rural Uganda

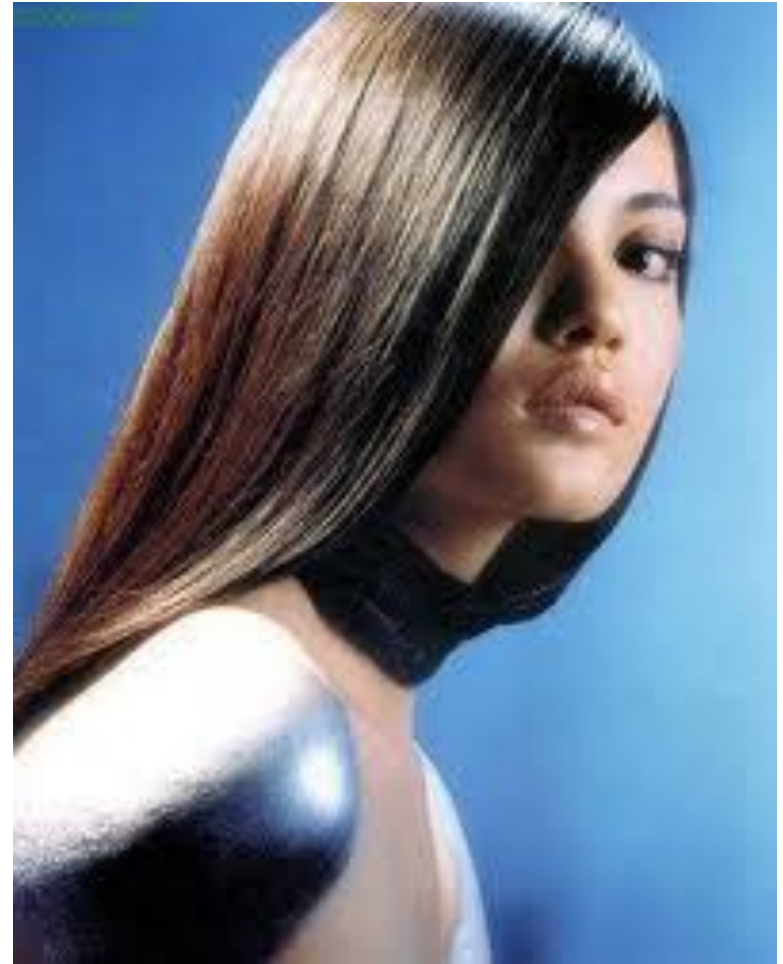
Peter K. Olds<sup>a</sup>, Julius P. Kiwanuka<sup>b</sup>, Denis Nansera<sup>b</sup>, Yong Huang<sup>c</sup>, Peter Bacchetti<sup>c</sup>, Chengshi Jin<sup>c</sup>, Monica Gandhi<sup>c</sup> & Jessica E. Haberer<sup>ad</sup>

## **Keratins and lipids in ethnic hair**

C. F. Cruz\*, M. M. Fernandes\*, A. C. Gomes<sup>†</sup>, L. Coderch<sup>‡</sup>, M. Martí<sup>‡</sup>, S. Méndez<sup>‡</sup>, L. Gales<sup>§</sup>, N. G. Azoia\*, U. Shimanovich\* and A. Cavaco-Paulo\*

- Hair is increasingly being recognized as repository for testing in Medicine
- But is all hair the same?
- Some suggests that curly hair may have a higher internal lipid content than straight hair
- Would that influence incorporation of lipid soluble drugs?
- If that is the case how would adjust for hair curvature?
- No scientifically valid way of defining hair curl

## What is “European” hair?



### **Simplistic non-scientific classification**

Asian

European

African hair


New human scientific hair classification – Loussouarn *et al* IJD 2007  
Based on geometry measurements

**STRAIGHT TO  
MINIMAL WAVE**



**TYPE I**

**OPEN  
WAVE**



Loose S-shaped  
curves

**TYPE II**

**WAVY**



Distinct S-shaped  
curves with uniform  
wave pattern

**TYPE III**

**CURLY**



Defined, mixed  
curl patterns: loops  
to spirals; ringlets  
to corkscrews

**TYPE IV**

**VERY  
CURLY**



Defined curl with  
S-shapes forming  
into coils

**TYPE V**

**COILED**



Loose  
afro-medium coils  
close to the scalp

**TYPE VI**

**VERY  
COILED**



Tight afro-distinct,  
springy coils closer  
to scalp

**TYPE VII**

**ZIG-ZAG  
COILED**

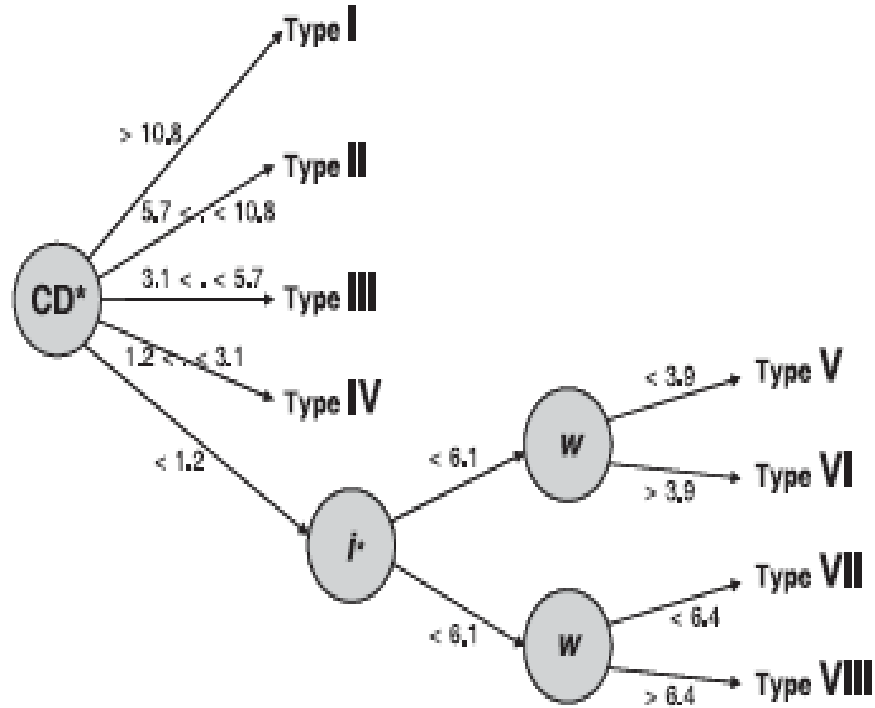


Extremely tight  
afro-interlocking  
coils and zig-zag  
patterns

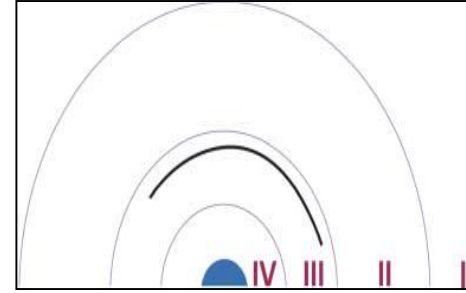
**TYPE VIII**



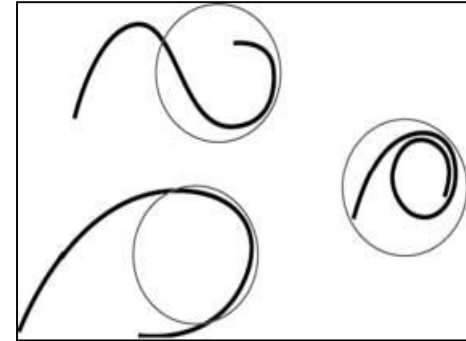
# Objective Hair Classification (Gold Standard)



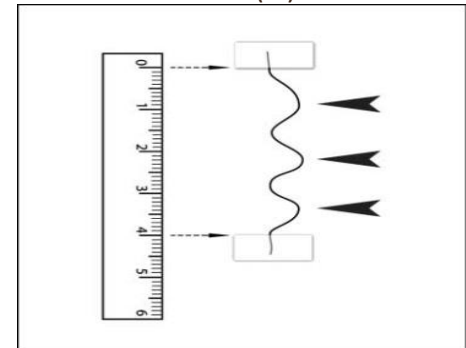
Curl Diameter (CD) meter



Curl Index (i)



Wave number (w)



**DST – Woman in Science Award (PhD student) 2014**  
**Ms Khwezi Mkentana 3<sup>rd</sup> year PhD Student**  
**Title: “Human Hair Characterization using geometry, biochemistry,  
ultra-structure and genetics.”**



**Minister N Pando  
DST**

**Mrs Mkentane  
Proud mom**

**Prof Glenda Gray  
MRC President**

# Ms Ntombi Sishi

- Cosmetic chemist
- Unique skills
- PhD Candidate

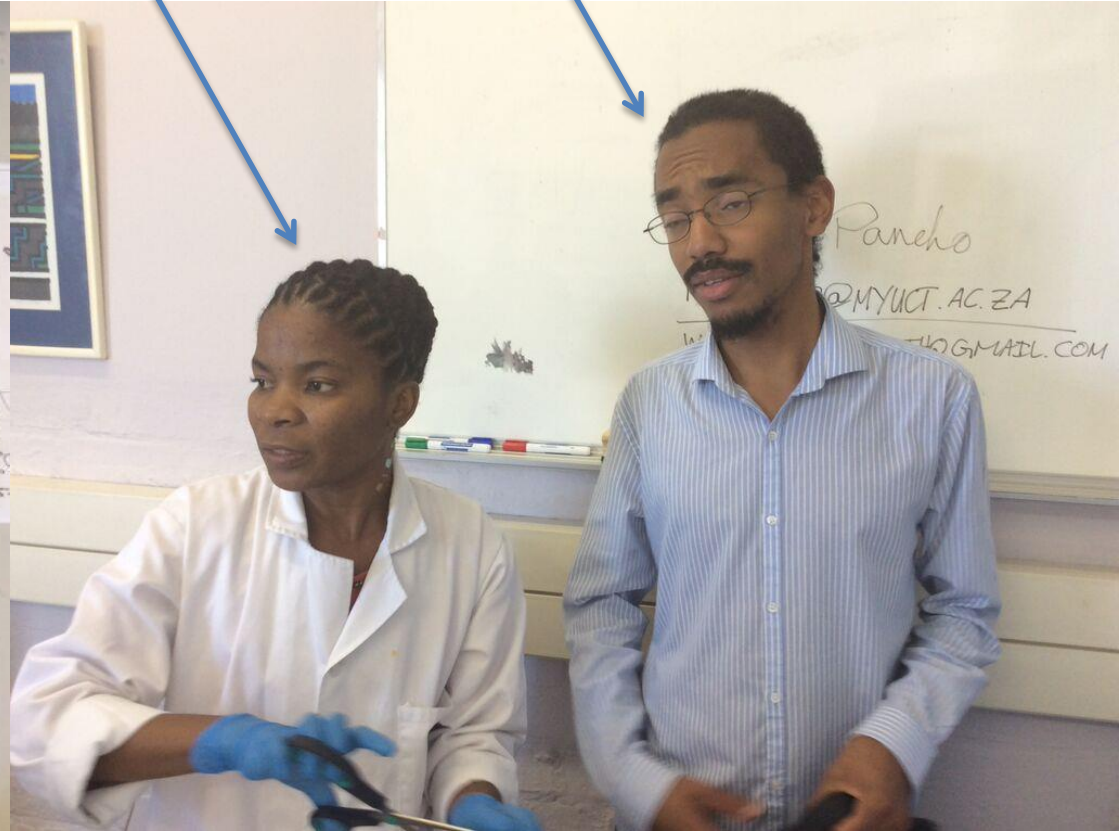


# Kind donation of hair for experiments...



Satisfaction

Not so sure...



We accept all donations of virgin hair from health subjects irrespective of age...



Including traditional shaving of (healthy) babies at 1year of age...  
Please call us...

# Scientist at work....







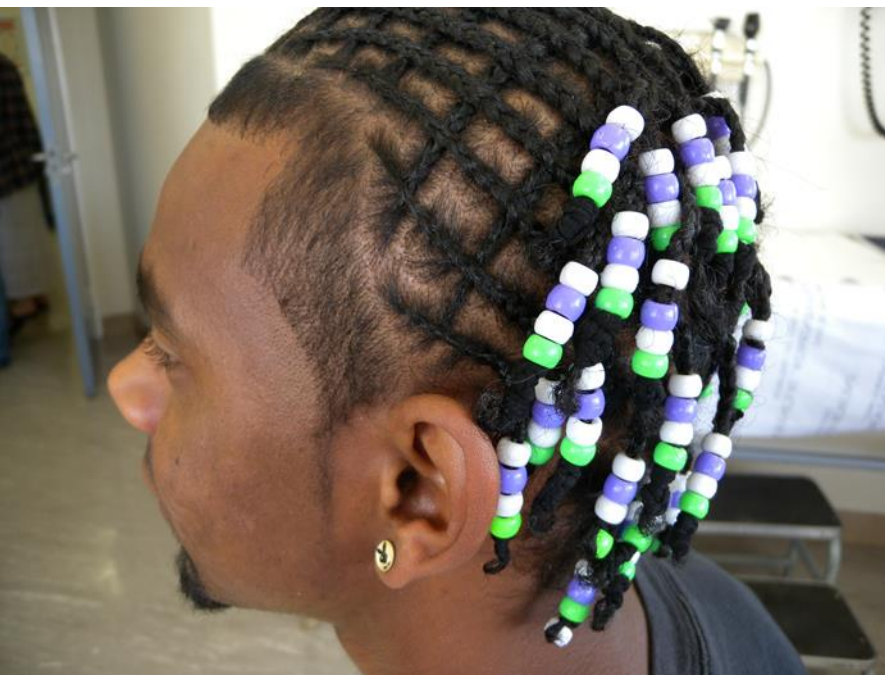
Thank you to the incredible clinical dermatology team who've given immeasurable support for this project



Open to mutually beneficial multidisciplinary collaborations...



**Forensic Medicine**  
**Pharmacology**  
**Public Health**  
**Other...**



Human hair  
a historic medical  
repository



Thank you to...



without whom we would not be celebrating today!