INTERNATIONAL NUCLEAR ATLANTIC CONFERENCE
XX ENFIR XIII ENAN V ENIN
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The Use of Radiosterilized Fish Skin To Treat Burn Victims

By: MD. Marcelo Borges
MD. Edmar Maciel
PhD. MD. Odorico Moraes

ACKNOWLEDGMENT

SPONSORED BY

Assistance To Burned People Institute

Ceará

Brazilian Electrical Company
COELCE / ENEL

Ceará

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SUPPORTING INSTITUTIONS

DRDC Drug Research and Development Center

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Faculdade de Medicina de Olinda
FMO

Pernambuco

ipen
Nuclear and Energy Research Institute

São Paulo

IJF

Ceará

LIKA
Laboratório de Imunopatologia Keizo Asami

Pernambuco

SÃO MARCOS

Pernambuco

Belief

12 cidades ciência/meio ambiente jornal do commercio Recife | 27 de novembro de 2011 | domingo

Couro de tilápia vira artesanato

REAPROVEITAMENTO Projeto em Serra Talhada, Sertão, também aproveita escamas, aumenta renda dos pescadores e reduz poluição

O couro, que pode ser empregado em bolsas e sapatos, por enquanto só está sendo estocado. A ideia é que sirva para a produção de artesanato na entressafra.

November/2011

Tilapia Fish Skin used for Handicraft.

The skin of Tilapia can be used to manufacture bags and shoes, but for the time it is being stocked. The idea is to make it become useful for handicraft production during off-season.

A MAJOR QUESTION CAME TO MY MIND

If the skin has enough resistance and delicacy to become a feminine accessory, why would it not have the same resistance and delicacy to replace temporarily human skin in burn treatment?

WHY TILAPIA FISH - KNOWLEDGE

- ✓ It is highly resistant to catching diseases;
- ✓ Antimicrobial action – Defensin/Hepcidin/IL-1β?
- ✓ It has an early reproductive capability – plenty raw-material;
- ✓ Fresh water – aquatic environment allows management of water quality control and lower risk of disease transmission;

KNOWLEDGE: PHYSICIAN IN CHARGE OF THE SKIN BANK HELD AT IMIP, IN RECIFE.

- ✓ CHLORHEXIDINE.
- ✓ GLYCEROL at high concentration.
  - Hyperosmolar environment (bacteria);
  - Hygroscopic action.
- ✓ Additional radiosterilization (virus).
  - Cobalt 60 gamma radiation.

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THEY MADE THE DIFFERENCE

MD. Edmar Maciel
General Coordinator

PhD. MD. Odorico Moraes
Scientific Coordinator

PRECLINICAL PHASE

24 MONTHS

LABORATORIES

ANIMALS

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DRDC – UFC – 70 Team Members

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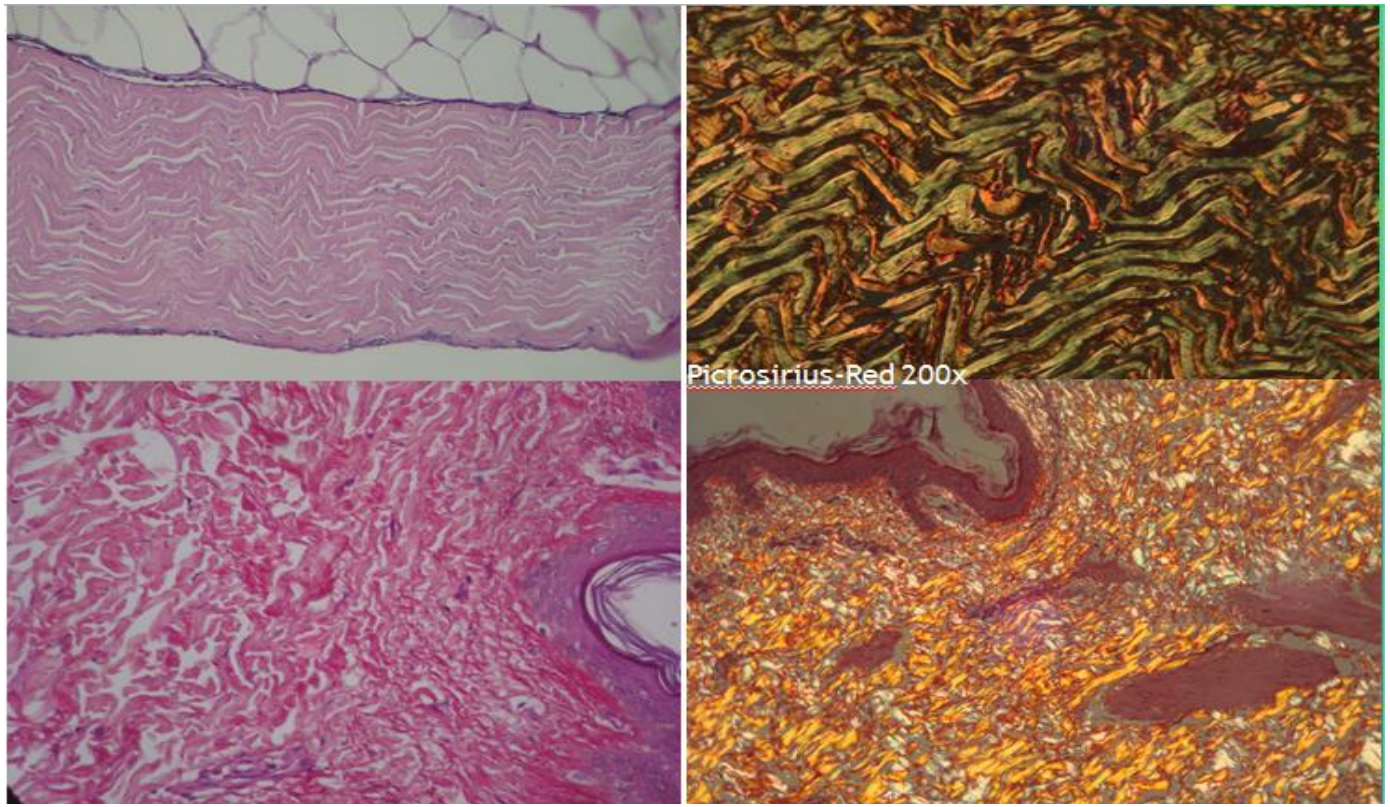
Tilapia Fish Skin HE 200x

DOUBLE

Ratio Collagen Type I:III
Human: 0,65 ± 0,06
Tilapia: 1,12 ± 0,15

Human Skin HE 200x



Comparative Histological Study Between Tilapia Fish Skin And Human Skin

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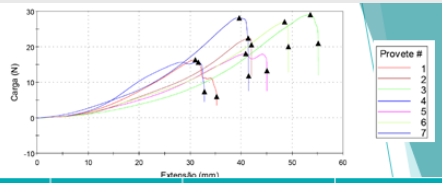
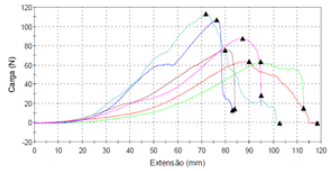
Skin Tension Study

Tilapia Skin



	Máx. Carga (N)	Deformação à tração em Máx. de Carga (%)	Carga em quebra (N)	Esforço à tração em quebra (N/mm²)	Extensão à tração em quebra (cm)
1	16,428	30,975	6,082	0,704	3,52
2	22,506	41,342	20,615	2,386	4,20
3	29,080	53,517	21,066	2,847	5,51
4	15,763	31,567	7,478	1,011	3,28
5	18,189	40,850	13,363	1,407	4,50
6	27,074	48,467	20,120	3,183	4,92
7	28,184	39,583	11,930	1,326	4,14
Coef.de Variação	25,53	20,06	43,98	52,31	17,96
Máximo	29,080	53,517	21,066	3,183	5,51
Mínimo	15,763	30,975	6,082	0,704	3,28
Média	22,46	40,90	14,37	1,837	4,295
Desvio Padrão	5,735	8,2055	6,325	0,961	0,771

Human Skin



Glicerol
Pele Total (abdomen)
Hidratada com 3 lavagens

	Máx. Carga (N)	Deformação à tração em Máx. de Carga (%)	Carga em quebra (N)	Esforço à tração em quebra (N/mm²)	Extensão à tração em quebra (cm)
1	63,730	89,775	-0,073	-0,009	11,83
2	75,578	79,025	14,786	1,760	8,30
3	63,609	86,717	15,512	1,633	10,47
4	113,373	71,725	-0,064	-0,006	10,26
5	107,046	76,225	13,440	1,292	8,28
6	87,661	87,075	28,787	3,129	9,48
Coef.de Variação	25,16541	8,74987	90,43851	91,58495	14,05588
Média	85,166	81,757	12,064	1,300	9,77
Desvio Padrão	21,43242	7,15363	10,91091	1,19052	1,37339

Extentiontry Test: Human: 4.615 cm / Tilapia 4.442 cm

Published By SBQ Journal, Volume 14th N. 3
2015/Jul., Aug., Sep. – Pg. 203 to 210

MICROBIOTA STUDY OF 20 FISHES

- Aeromonas hydrophila
- Aeromonas sóbria
- Aeromonas veronii
- Candida parapsilosis
- E. Coli
- Globicatella sanguinis
- Klebsiella pneumoniae
- Kocuria varians
- Pseudomonas aeruginosa
- Pseudomonas stutzeri
- Sphingomonas paucimobilis
- Streptococcus suis
- Streptococcus uberis

< 100,000 CFU/g of tissue

Skin & Oral Cavity

PUBLISHED BY UNICHRISTUS JOURNAL

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PROCESSING TILAPIA FISH SKIN

From Castanhão Weir to DRDC

- Skin Removal;
- Washing Skin Under Running Water;
- Skin Inside Plastic Containers, In An Isothermal Box, is taken to Fortaleza.

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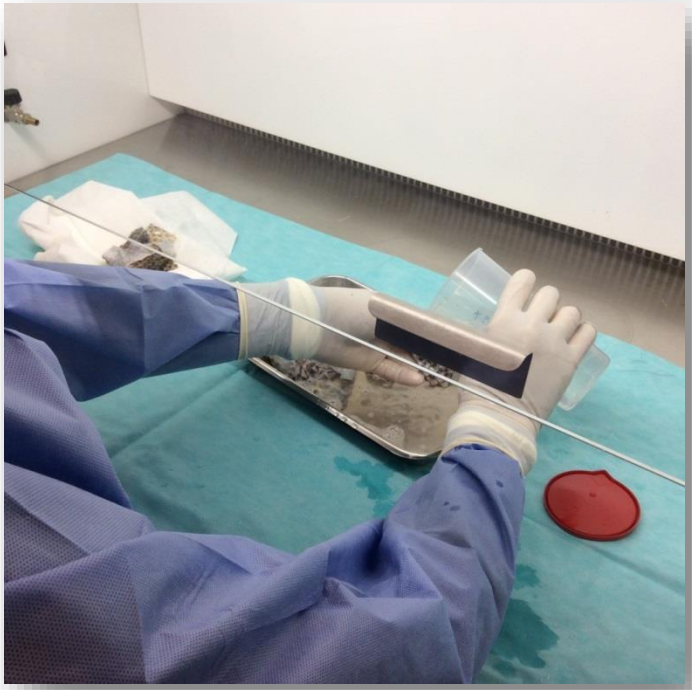
PROCESSING TILAPIA FISH SKIN - DRDC

- Cleansing Remaining Pieces of Muscles;
- Cutting Skin Out Into Pieces Of 10X5cm;
- C1 - Chlorhexidine at 2% Concentration for 1 hour;
- G2 - Glycerol at 75% Concentration + 25% Concentration Salt Solution, for 1 hour.

Laminar Flow

- G3 - Glycerol at 100% Concentration + Warm Water Bath at 15rpm, 37ºC – for 3 hours;
- Storage – Double Sealed at 4ºC, Sterile Double Plastic Envelopes.



Irradiated Skin – Nuclear and Energy Research Institute (IPEN)

Irradiated Skin – Nuclear and Energy Research Institute (IPEN)

Mônica Mathor – IPEN Researcher

Irradiated Skin – Nuclear and Energy Research Institute (IPEN)

Delivery Box 4˚C

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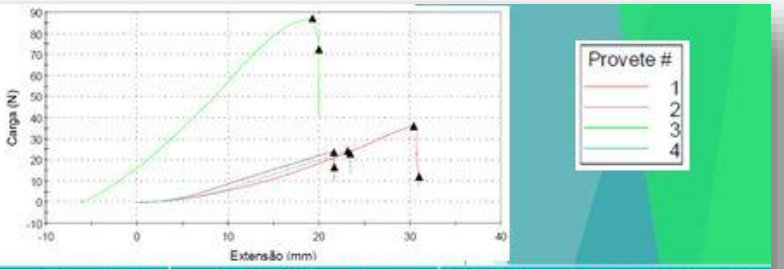
Irradiated Skin

Tilapia Fish Skin
Irradiated 30kGy



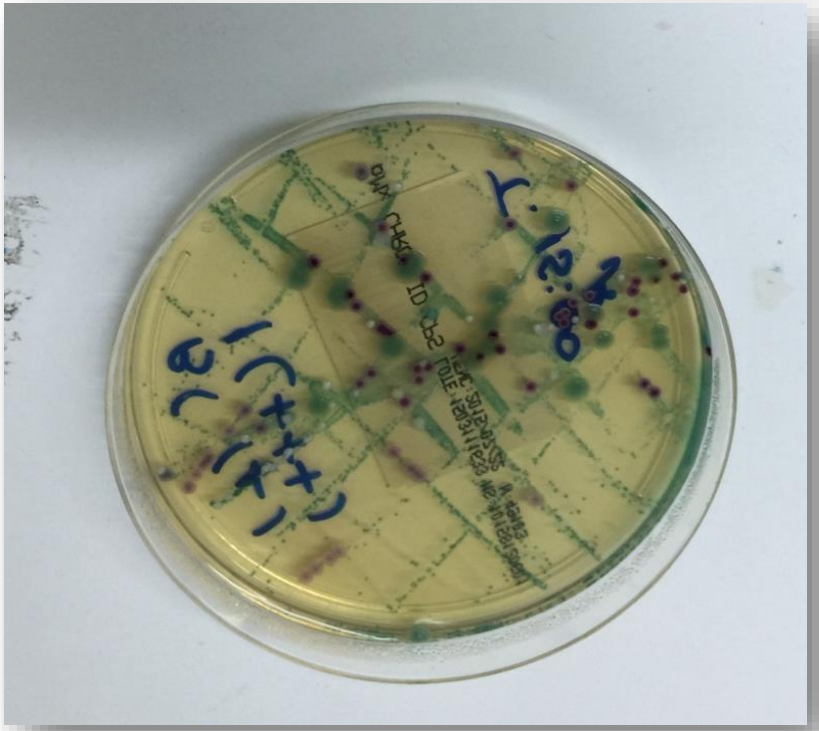
	Máx. Carga (N)	Deformação à tração em Máx. de Carga (%)	Carga em quebra (N)	Esforço à tração em quebra (N/mm²)	Extensão à tração em quebra (cm)
1	36,293	30,358	12,471	1,134	3,09
2	23,941	21,592	17,002	1,619	2,16
3	87,157 4	25,483	72,525	7,883	2,62
4	24,629	23,117	23,299	1,820	2,34
Coef. Variação	69,70203	15,24125	88,82432	102,51455	15,88904
Máx	87,157	30,358	72,525	7,883	3,09
Média	43,005	25,137	31,324	3,114	2,55
Mín	23,941	21,592	12,471	1,134	2,16
Desv. Padrão	29,97529	3,83126	27,82375	3,19242	0,40580

2016/March

MICROBIOLOGY

- Microbiological Testing In Every Stage – Negative for Gram+, Gram- and Fungi.

- 4 Stages – 2 Glycerol, 1 Chlorhexidine And 1 Applying Skin.



Microbiological Testing

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Testing Appliance Of Tilapia Fish Skin to 40 Wistar Rats

CEUA Approval Under Register 48/2016

PUBLISHED BY SBCP JOURNAL

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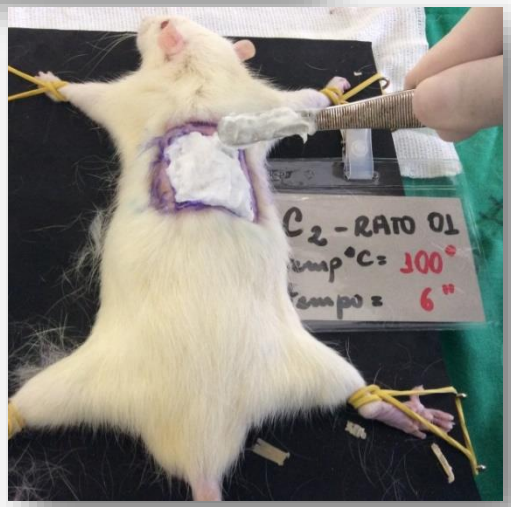
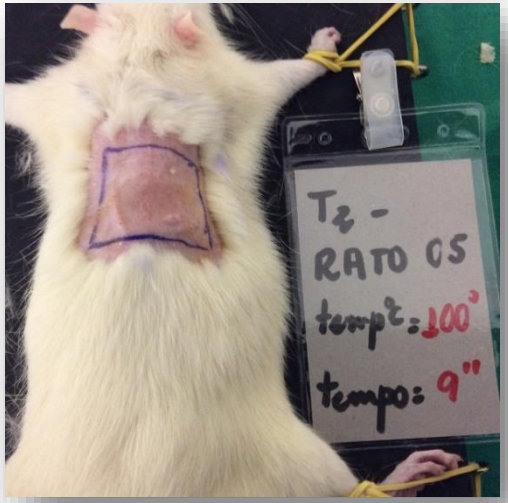
TESTING IN WISTAR RATS





MACROSCOPIC EVALUATION

- Wound Measurement;
- Borders Retraction / Crust Formation;
- Rats Were Kept Alive Until 22nd day of P.O.

CONCLUSION

Good outcome from the appliance of tilapia fish skin to the wounds was obtained as regarding adherence to rat's skin and wound healing improvements: absence of exudate, crusts and hyper granulation.

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Animal Skin Bank – 1st In Brazil

- ISO 5 And 7
- Decontaminated & Sterilized Room

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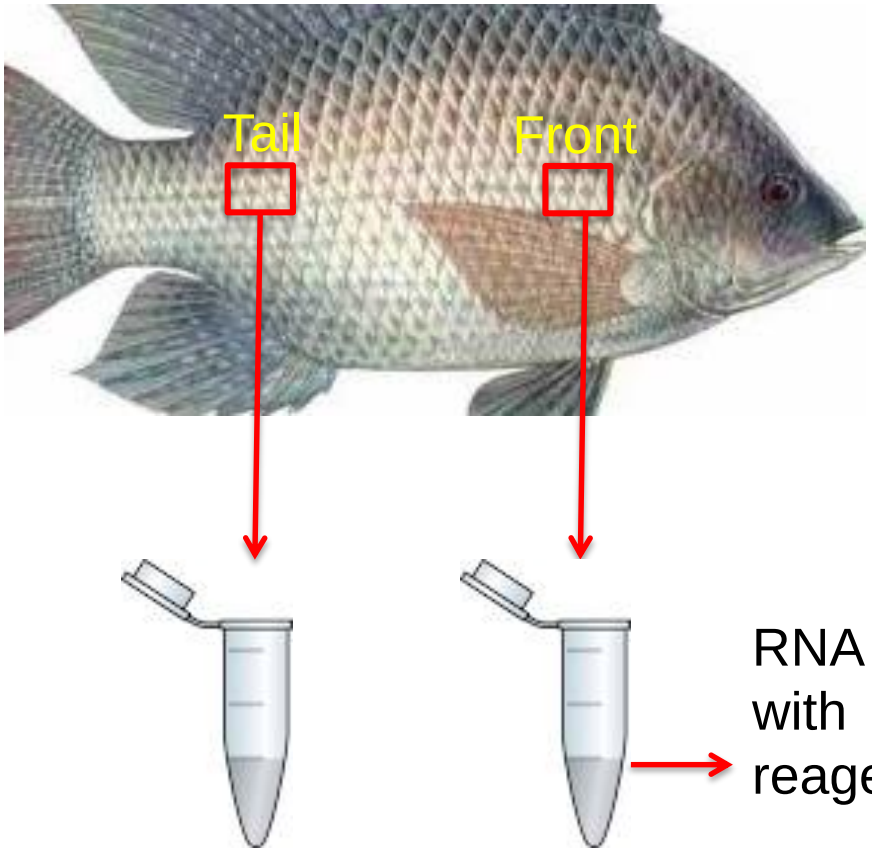
Evaluation Of Antimicrobial Peptides (AMPs) On The *Oreochromis niloticus* Skin.

Does skin from Tilapia (*O. niloticus*) express β-Defensin, Piscidin, Hepcidin, and IL-1β?

LIKA
Laboratório de Imunopatologia Keizo Asami
Pernambuco

Methodology: Skin samples from the front and tail portion of *Oreochromis niloticus*

Evaluation in two portions

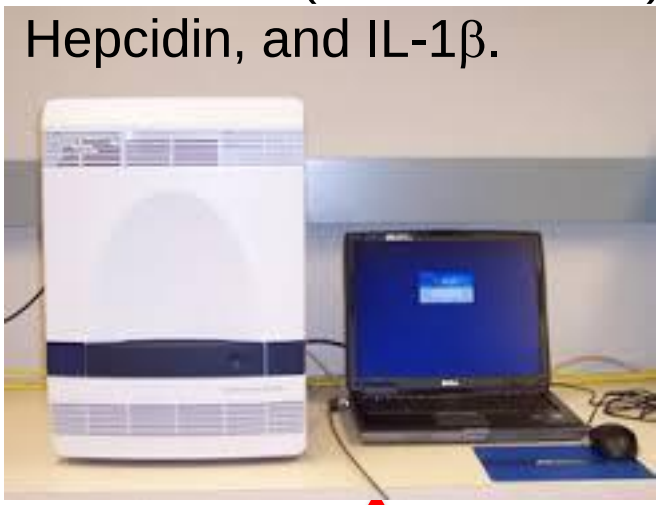


1ml of RNAlater- RNA Stabilization Reagent immediately stabilizes RNA .

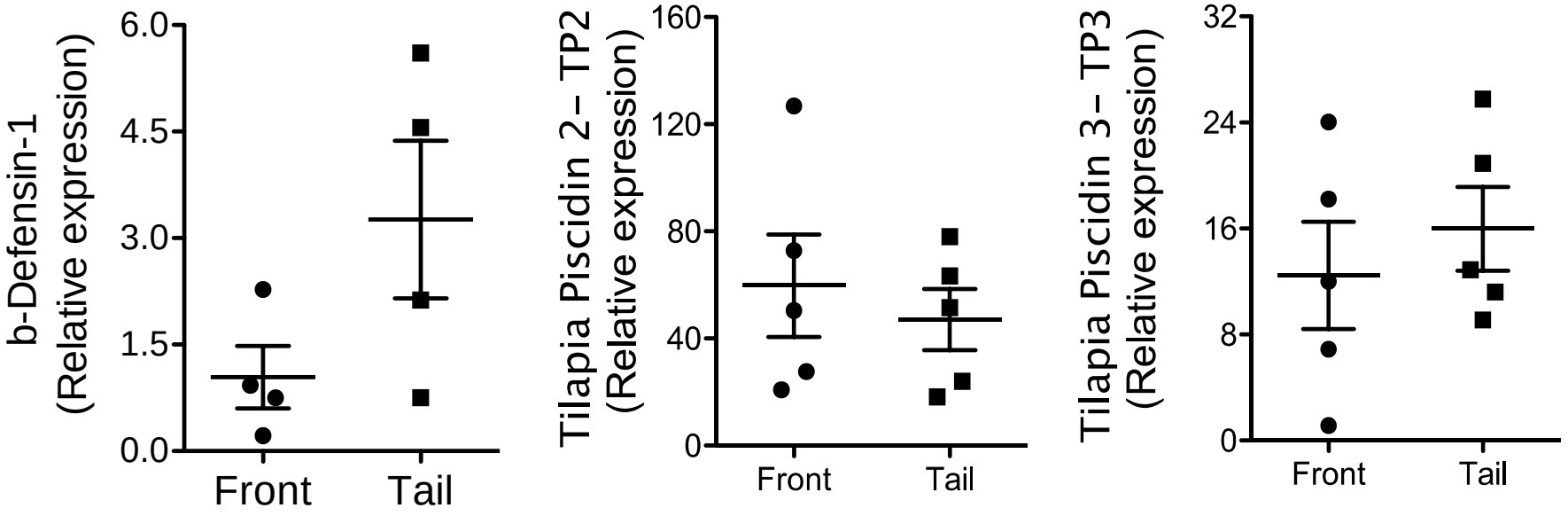
RNA extration with Trizol reagent.

Synthesis of DNA from RNA - cDNA

Real Time qPCR – Primers: β-defensin1, Piscidin (2 and 3), Hepcidin, and IL-1β.

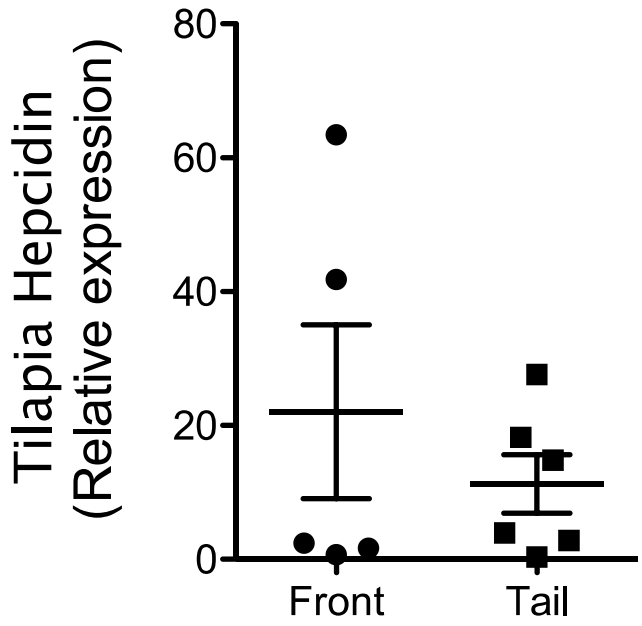


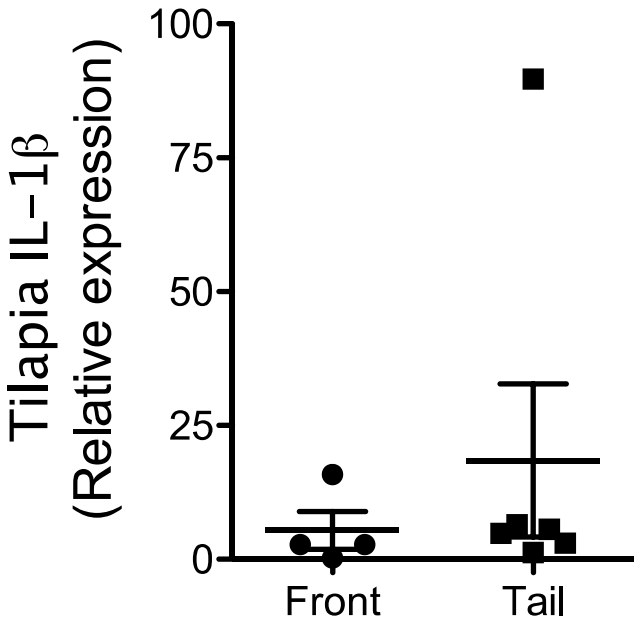
β-Defensin 1, TP2 and TP3 relative expression on skin from *Oreochromis niloticus.*



- Relative expression to β-actin (housekeeping gene; constitutive gene).
- No statistically significant difference between two groups (front and tail), n=4-5.

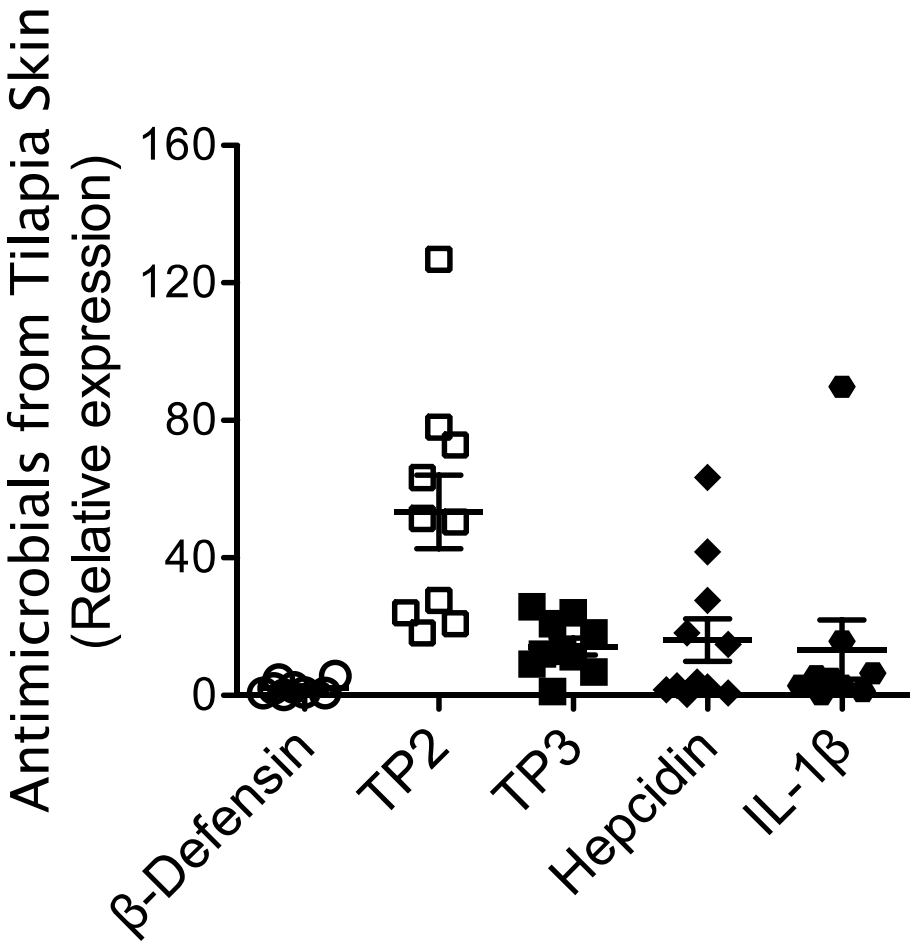
Hepcidin and IL-1β relative expression on skin from *Oreochromis niloticus*





- Relative expression to β-actin (housekeeping gene; constitutive gene).
- No statistically significant difference between two groups (front and tail), n=4-5.

Overview results of antimicrobials on natural skin from *Oreochromis niloticus.*



Next steps:

- Antimicrobial evaluation on skin after radiosterilization;
- Protein analysis of the antimicrobial peptides in the skin before and after irradiation;
- Microbicidal evaluation of peptides from *O. h[illegible]tic[illegible]* skin.

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Clinical Trial

Tilapia Fish Skin

x

SSD

MORE THAN 100 PATIENTS

Phases II and III (In Progress)

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A1

Superficial Partial Thickness Burns Outpatient

A1 FP 110353

Healing Time – 09 days

No dressing changes

A1 AR 311278

Healing Time – 10 days

No skin replacement

A1 MD 250172

Healing Time – 10 days

Skin replacement - 01

A1 PS 261279

Healing Time – 10 days

No skin replacement

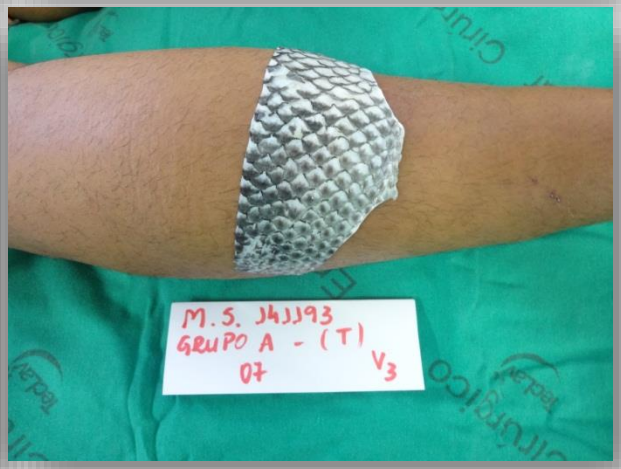
A_1 YS 120397

Healing Time – 12 days

A1 MS 141193

Healing Time – 11 days

Skin replacement - 01



A1 FR 010176

Healing Time – 09 days

No skin replacement

A1 JS 300793

Healing Time – 10 days

No skin replacement

No analgesics

A1 AS 231275

Healing Time – 10 days

No skin replacement

A_1 MN 130967

Healing Time – 11 days

No skin replacement

A1 AP 130167

Healing Time – 09 days

No skin replacement

A1 AP 130167

Healing Time – 09 days

No skin replacement

A1 LR 090976

Healing Time – 11 days

No skin replacement

A1 FR 050492

Healing Time – 11 days

No skin replacement

Both legs

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B1

Deep Partial Thickness Burns Inpatient

B_1 MS 050880

Healing Time – 12 days

Skin replacement - 01

B1 GS 180180

Skin replacement - 01

B_1 GS 180180

Healing Time – 10 days

Dressing changes under anesthesia - 02

B_1 MH 180773

Healing Time – 10 days

No dressing changes

B1 MH 180773

Early deambulation

B_1 AS 210171

Healing Time – 09 days

No skin replacement

B1 AS 210171

Skin replacement - 01

B_1 EC 221087

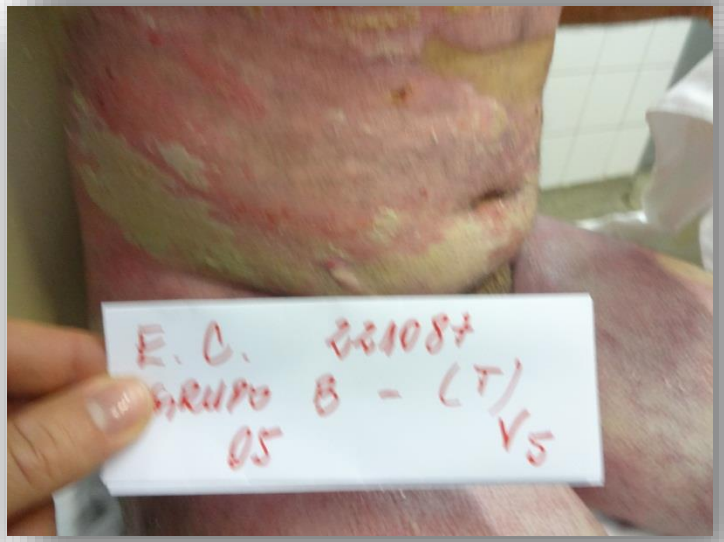
Healing Time – 11 days

No skin replacement

B_1 EC 221087

Healing Time – 11 days

No skin replacement



B_1 EC 221087

Skin replacement - 03

Debridements - 03

Healing Time – 18 days

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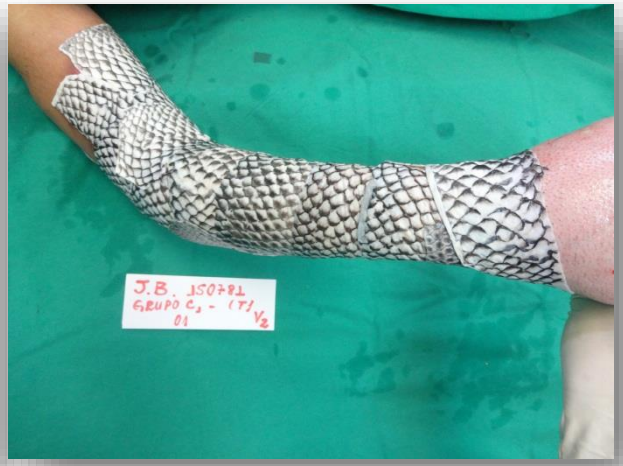
C1

Deep Partial Thickness Burns Inpatient

C1 JB 150781

Skin replacement – 03



C1 JB 150781

Healing Time – 18 days

Dressing changes under anesthesia - 04

C1 AS 021082

Skin replacement – 01

C_1 AS 021082

No analgesics during 10 days

C_1 AS 021082

Dressing changes under anesthesia– 02

Healing Time – 17 days

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D1

Full Thickness Burns


R.S. 200867
GRUPO D1 - (T)
10 pele de tilápia


R.S. 200867
GRUPO D1 - (T)
10 pele de tilápia


FN040383 T
GRUPO C1-N°02
V5


FN040383 T
GRUPO C1-N°02
V5


F.N. 040383
GRUPO C1 - (T)
02
V


F.N. 040383
GRUPO C1 - (T)
02
V


F.N. 040383
GRUPO C, - (T)
02
V7


F.N. 040383
GRUPO C, - (T)
02
V7

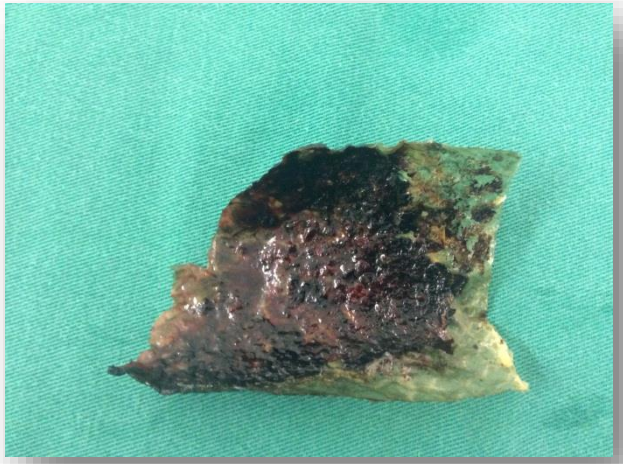

F.N. 040383
GRUPO C, - (T)
02
V7


FN040383 (T)

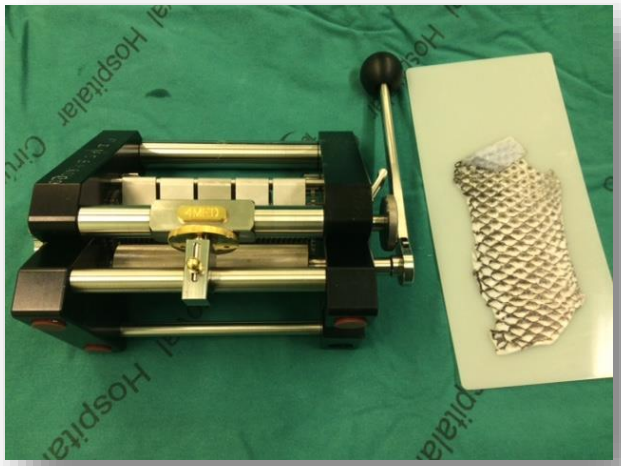
Donor site





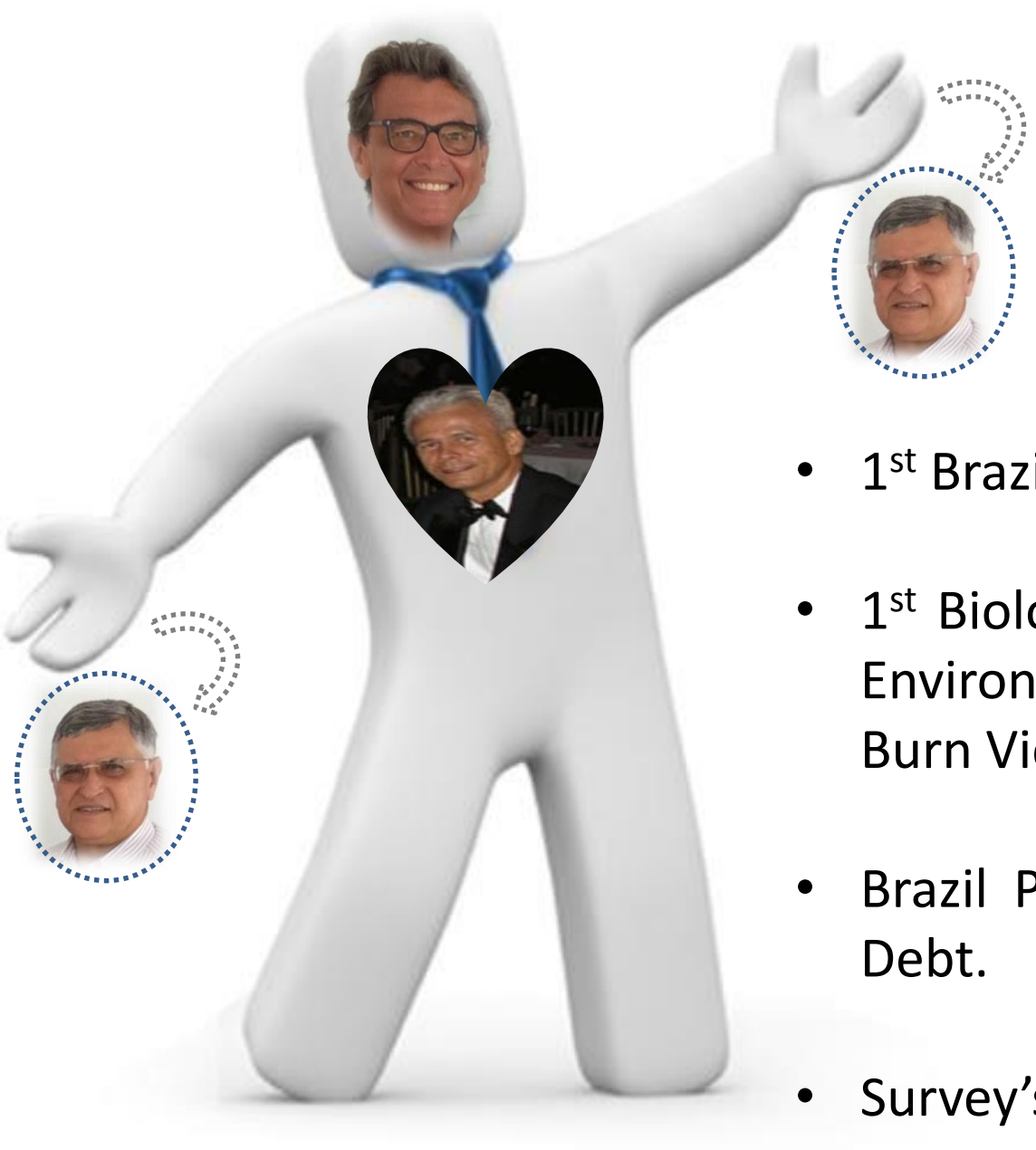


Donor site



BENEFITS

- Good Adherence To The Wound, Reducing Fluid Loss
- No External Contamination;
- Reduced Number Of Dressing Changes;
- Reduce Pain(30% to 50%) And Costs (57%) Compared To SSD
- Absorption of secretions (Like a Foam);
- No Dirty Dressing Or Bad Odor;
- Reduce In Healing Time(2,5 days);
- Lower Risk of Infection (Peptides) ?



- 1st Brazilian Xenograft.
- 1st Biological Dressing From Aquatic Environment, In The World, To Treat Burn Victims (Clinical Trial)
- Brazil Pays Off A 50 Year Scientific Debt.
- Survey's Future…
- Midia Impact

The Following New York Post Video had over 35 Million Views and received more than 11 Thousand Comments.

"If one dreams on his own it is just a dream; if many dream together it is the beginning of a new reality."

- Miguel de Cervantes -

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THANK YOU