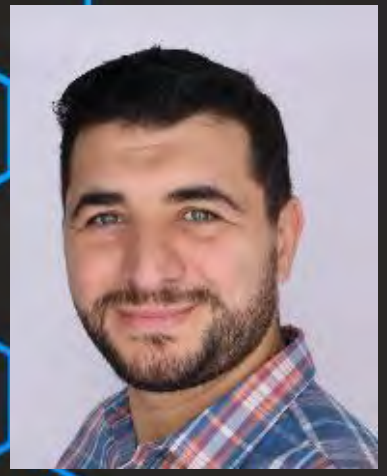
Medical Grade HONEY

~ Evidence-based Applications ~



Ferhat Ozturk, Ph.D.

MDM WOUND VENTURES

HONEY PATHWAY

USDA nextgen

UT San Antonio

SR SUL ROSS STATE UNIVERSITY INTERNATIONAL

The content of this presentation is not intended to be a substitute for professional medical advice, diagnosis, or treatment. Always seek the advice of your physician or other qualified health provider with any questions you may have regarding a medical condition.

USDA nextgen

HONEY PATHWAY
UTSA
The University of Texas at San Antonio
College of Sciences

Outline

01 Honey as Medicine

02 Honey Bioactivity

03 Practical Applications

04 Medical Grade Honey: Clinical Applications

05 Medical Grade Honey in the Medical Market

06 Local BioActive Honeys

1

Honey

The sweetest stuff

Is honey just a sugary food?

Honeybees and Pollination

- The life of many plant species depends on bee pollination.
- The reduction of bee colonies poses a serious risk to many plant species survival, and can also be considered a biomarker for human health
- About 75% of food crops is pollinated by insects, mostly by honeybees

https://www.wholefoodsmarket.com/mission-in-action/environmental-stewardship/pollinator-health

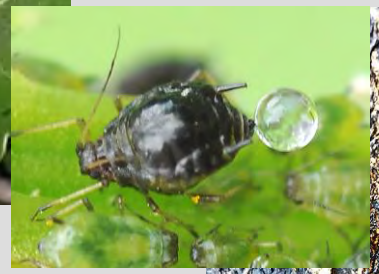
TYPES OF HONEY

BLOSSOM HONEY

HONEYDEW HONEY

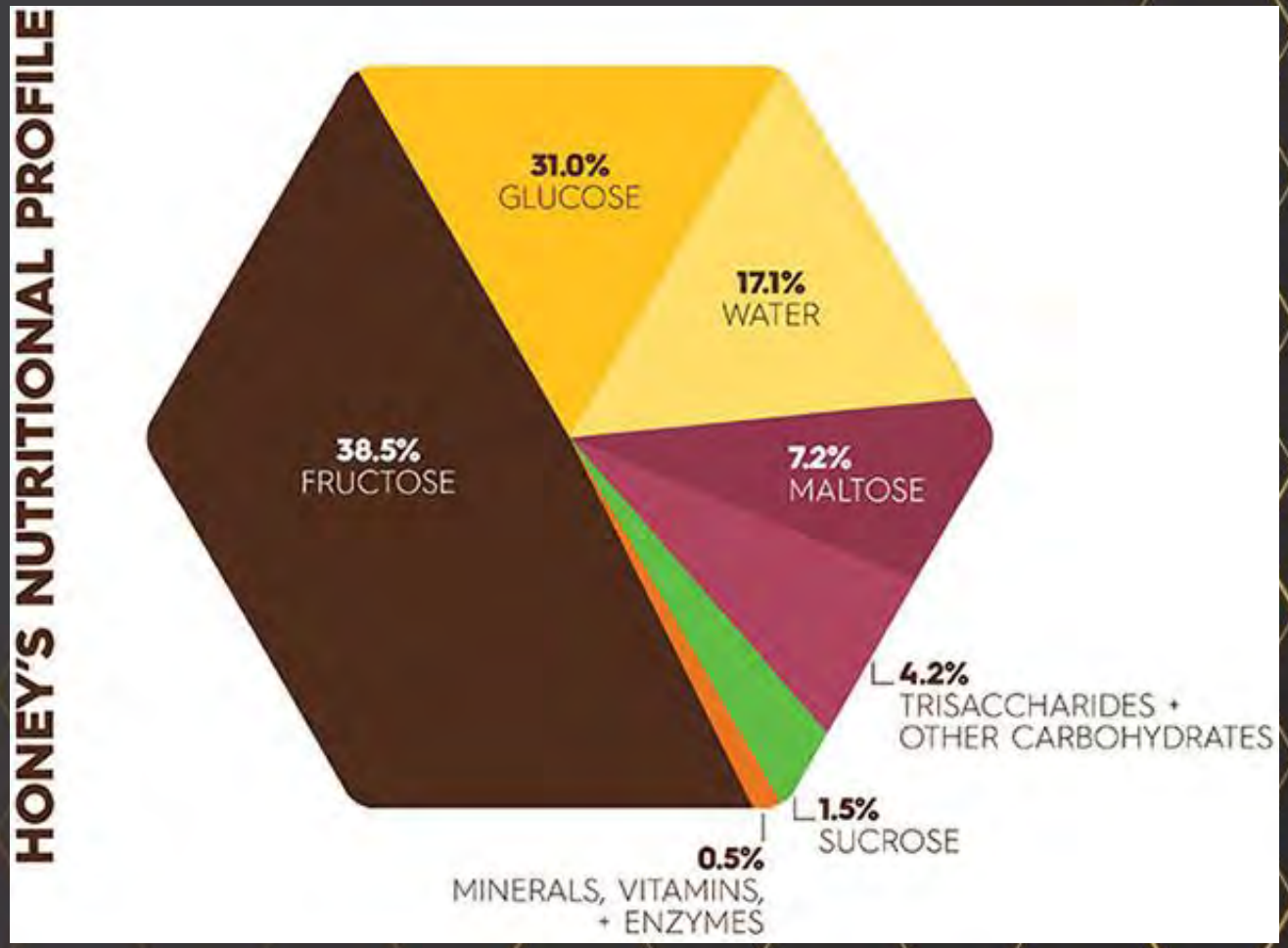
Fir, Pine, Spruce, Salix, Castanea, Oak, Olea, Tilia, Betula, Aesculus

Spotted Lanternfly & Aphids



HONEY

A Natural **Therapeutic** Agent



Honey can contain over 3500 compounds

HONEY PATHWAY

UTSA
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HONEY Contents

BioActivity

Phenolic Acids
Flavonoids
Tannins
Enzymes
Vitamins
Minerals

Sugars

Fructose
Sucrose
Theralose
Glucose
Maltose
Turanose
Erlose

Invertase
Diastase
Nigerose
Glucose Oxidase
Catalase

Enzymes
Elements
Proteins

Aluminum
Phosphorus
Zinc
Iron
Potassium
Magnesium
Aspartic Acid
Manganese
Proline
Lysine

Honey is Medicine

Gastro-intestinal Diseases

Cancer

Wound Healing

Respiratory Infections

Neurological Diseases

Cardio-vascular Diseases

Diabetes

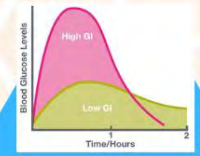
Medical Grade Honey

Antioxidant

Anti-Inflammatory

Antimicrobial

Immuno-Modulatory

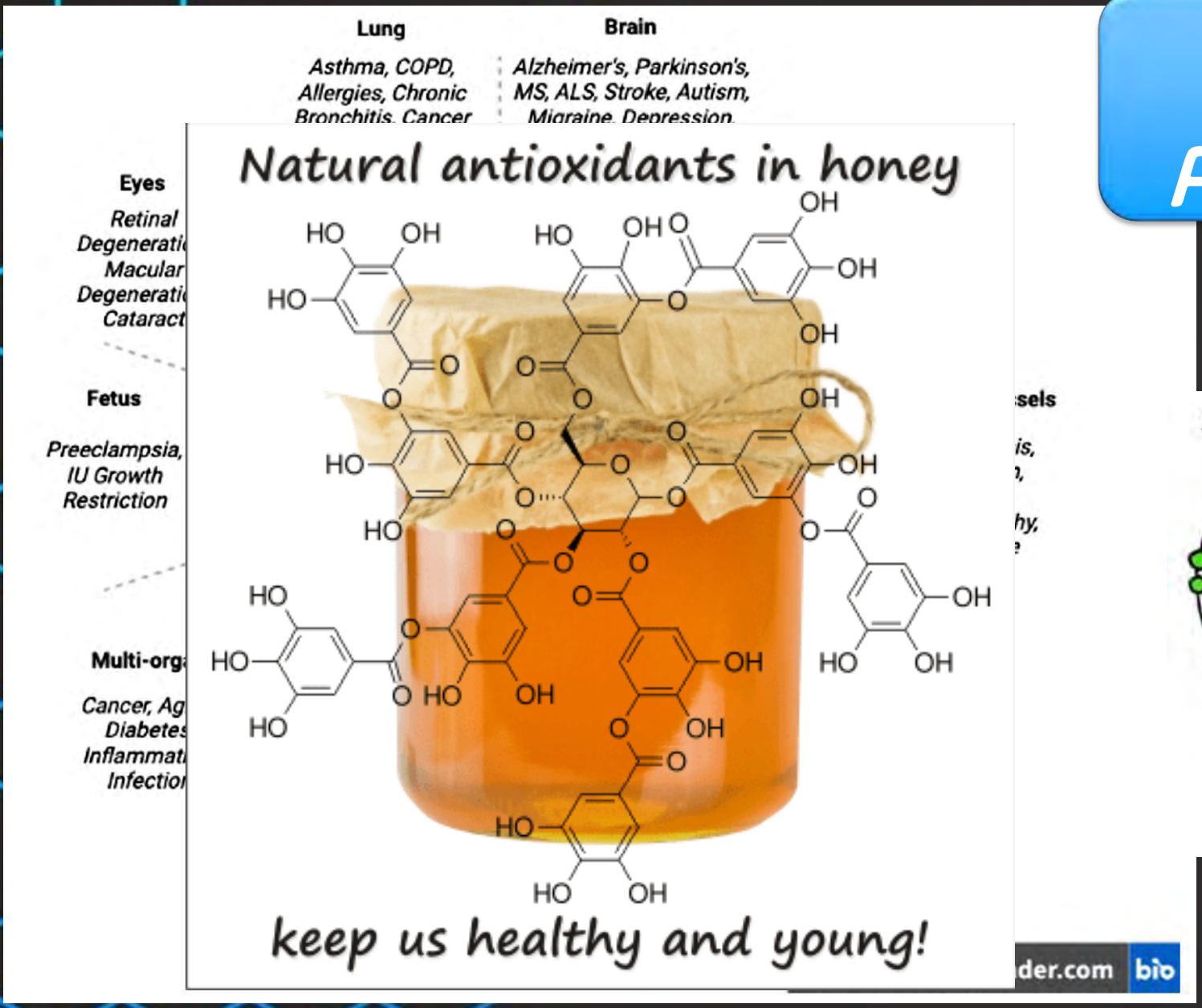


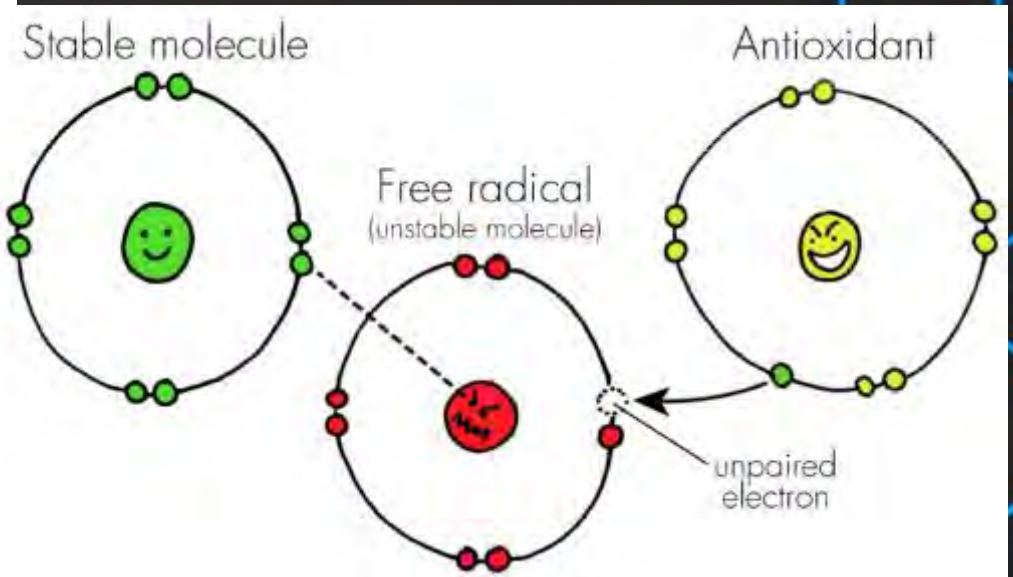
Low Glycemic Index

2

Honey Bioactivity

Honey as an Antioxidant Agent





Pham-Huy, LA, He, H, Pham-Huy, C. Free radicals, antioxidants in disease and health. *Int J Biomed Sci* 2008;4:89–96.10.59566/IJBS.2008.4089

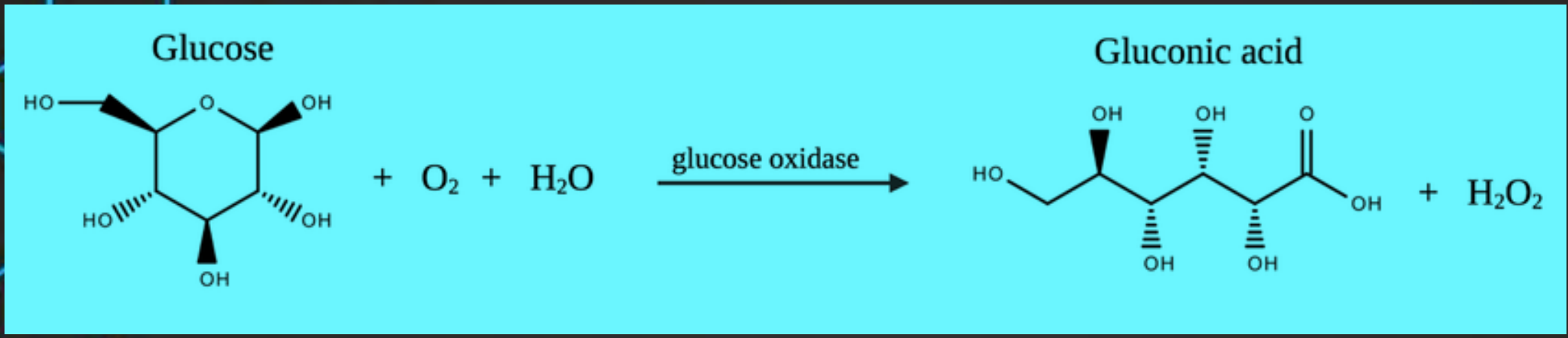
BOX 1. **ANTIMICROBIAL EFFECT OF HONEY**

The antimicrobial effect of honey is achieved through a range of factors:

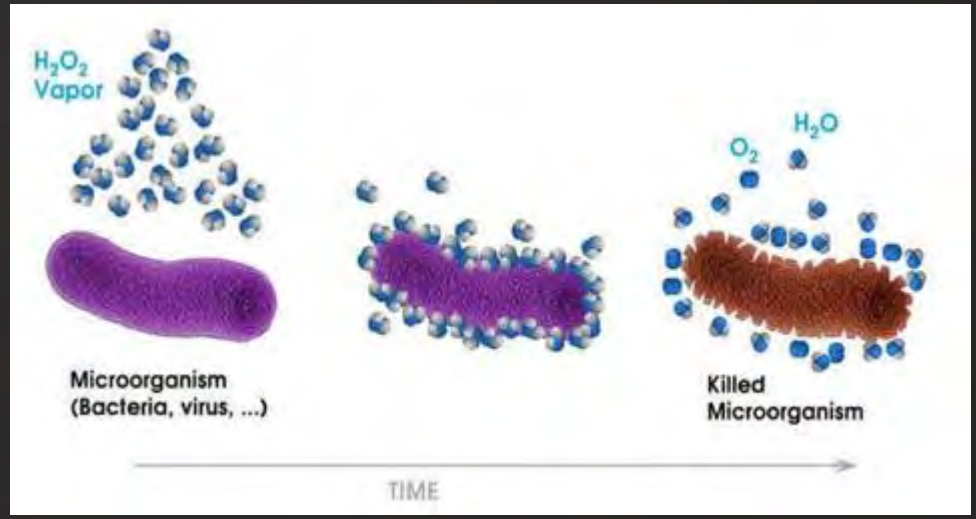
- A low moisture content deprives bacteria of water and therefore prevents growth
- A high sugar content extracts water from bacteria by osmosis
- A low pH inhibits bacterial growth
- Production of hydrogen peroxide by the action of the enzyme glucose oxidase, when honey is diluted with wound exudate; the hydrogen peroxide breaks down, releasing low concentrations of reactive oxygen, destroying invading microbes and promoting healing
- The presence of bee defensin 1, an antimicrobial peptide passed to the honey from the bee's immune system, is thought to disrupt the bacterial cell membrane
- The presence of the antimicrobial methylglyoxal – manuka honey contains up to 100 times higher concentrations of methylglyoxal than other honeys

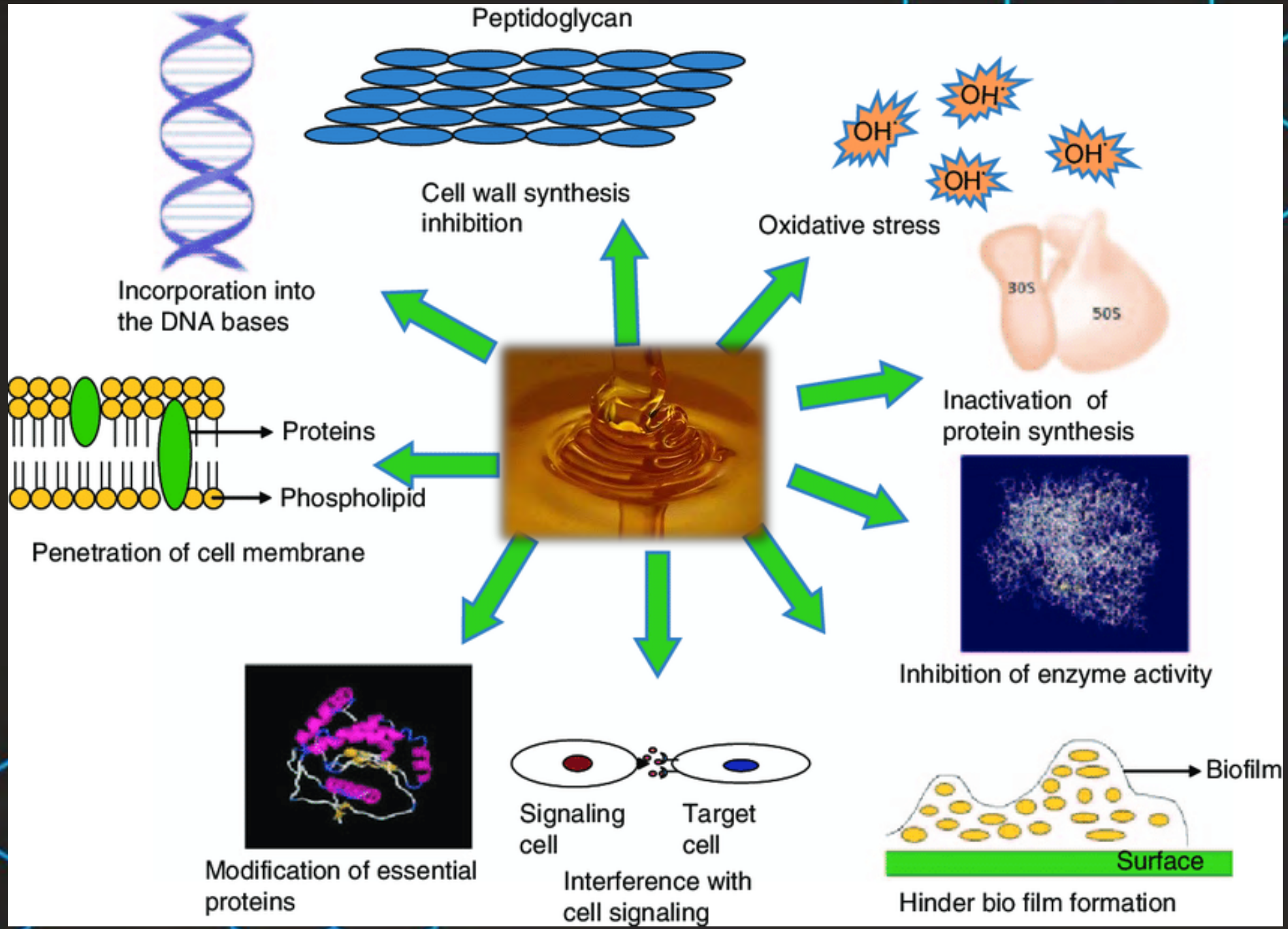
Honey as an Antibacterial Agent

Honey's Peroxide Activity



Oxidative Stress





Adapted from

Rajni Singh, M S Smitha, Surinder P Singh

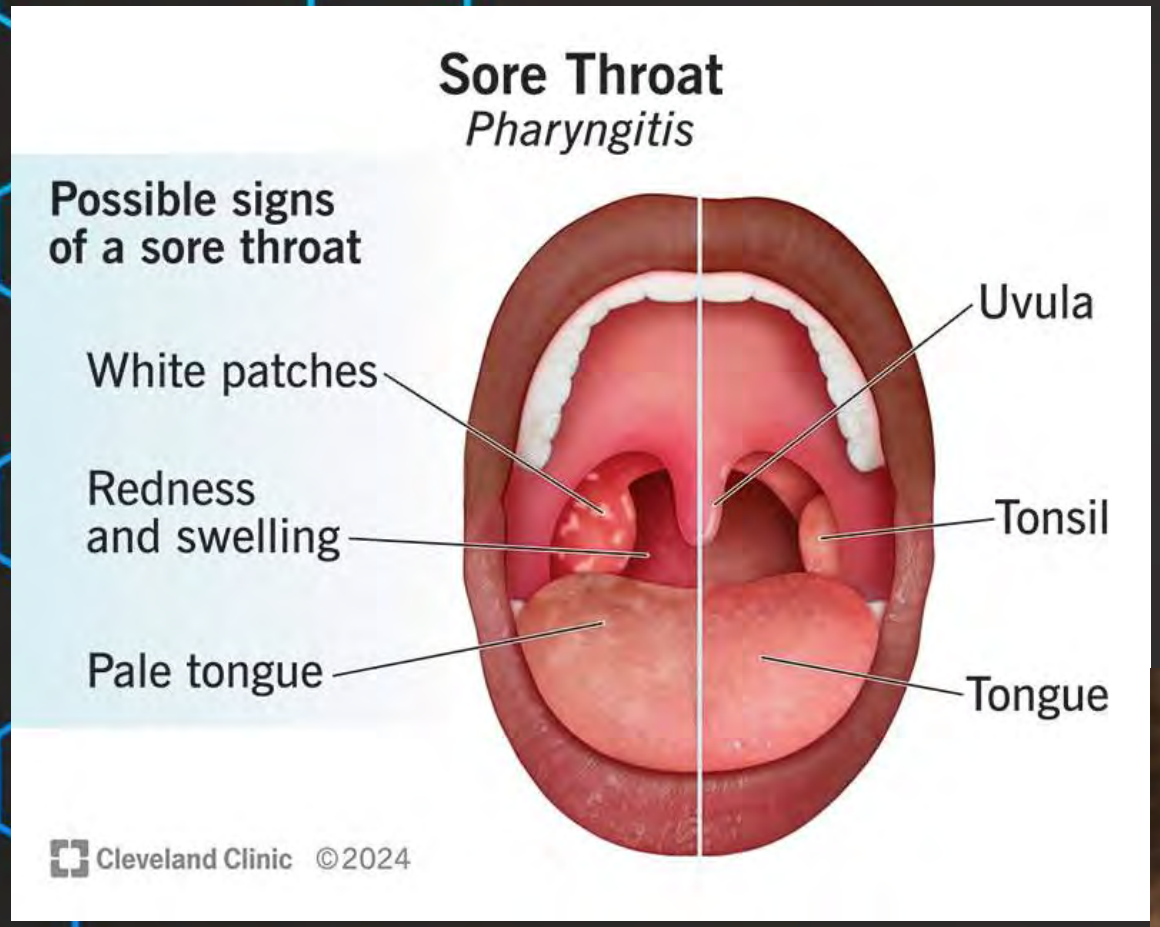
The role of nanotechnology in combating multi-drug resistant bacteria

J Nanosci Nanotechnol 2014 Jul;14(7):4745-56. doi: 10.1166/jnn.2014.9527.

3

Practical Applications of Honey for Health

Honey for Sore Throat



Before Honey Treatment

Honey for Acne Treatment - UTSA Student

After Honey Treatment (6-7 weeks)

Plate. 1

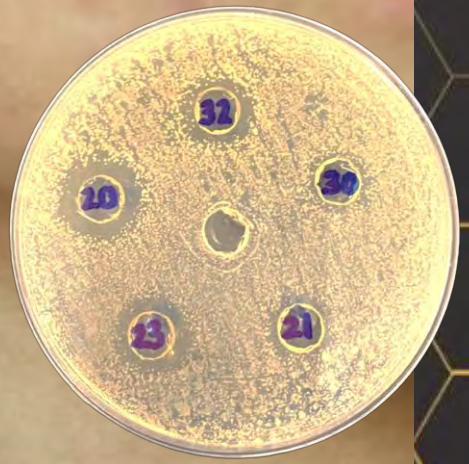


Plate. 2

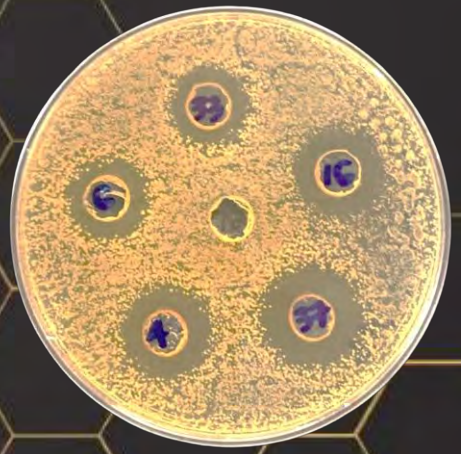
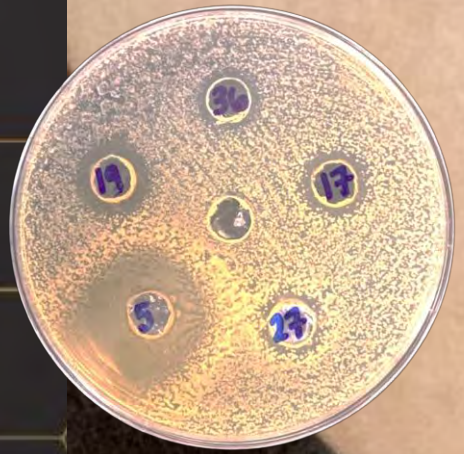
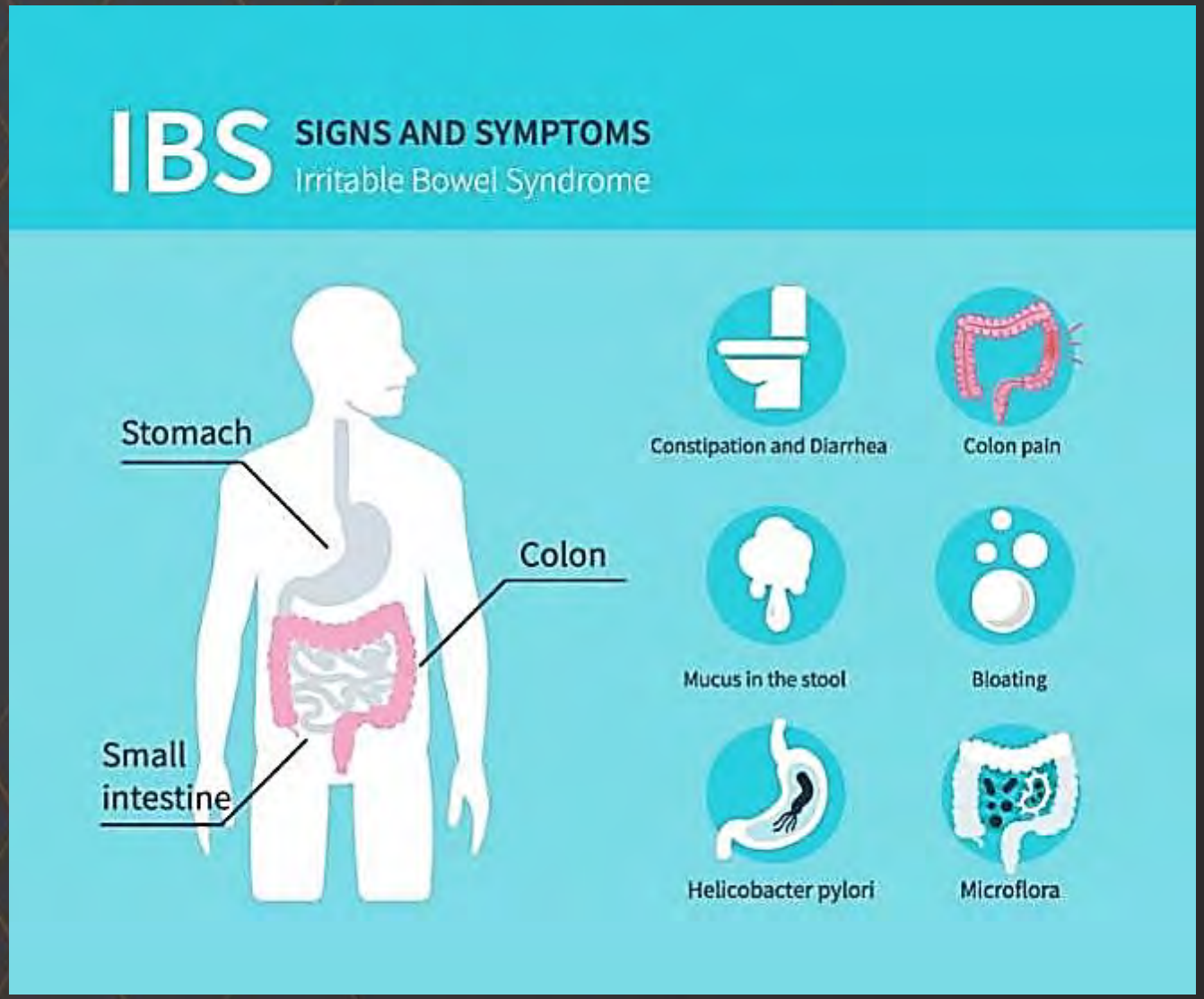


Plate. 3



Honey for Gastrointestinal Diseases

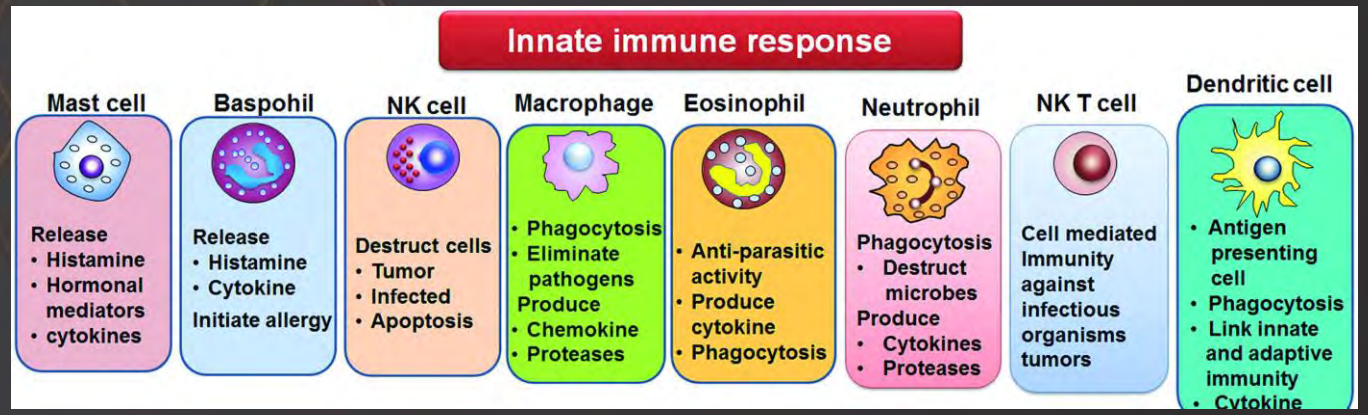


Warm honey drink for constipation

Cold honey drink for diarrhea

Honey into empty stomach for ulcer

Honey for Allergies

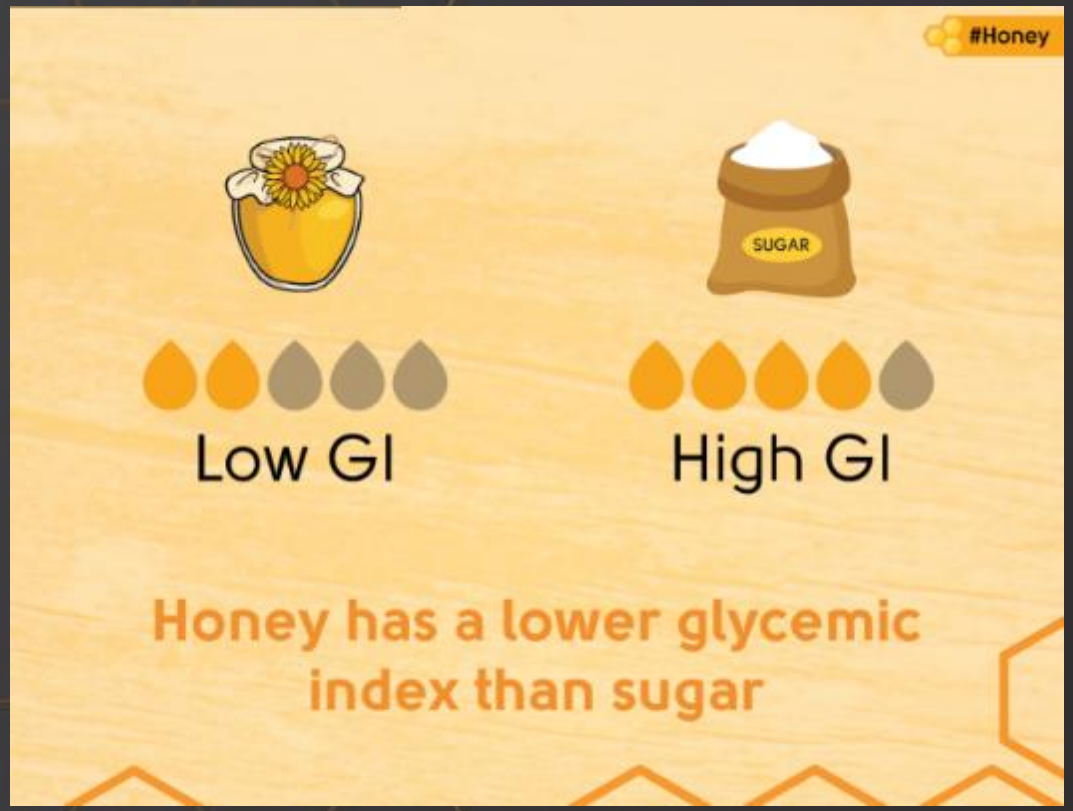


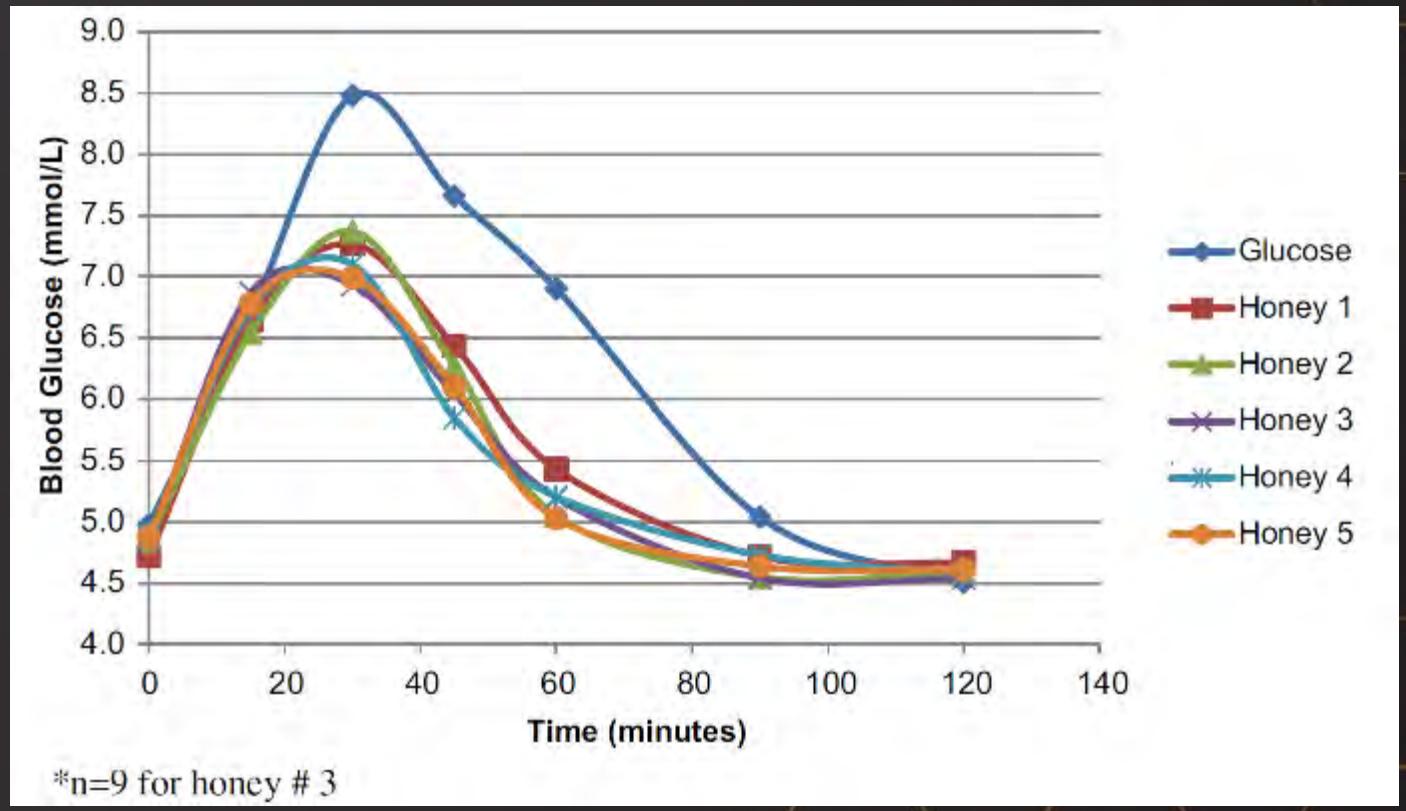
https://doi.org/10.3389/fpls.2015.00655

Wind Pollination:
Small, lightweight, and produced in vast amounts.
Allergen dispersion

Animal Pollination:
Larger, sticky, or spiky

Honey and Diabetes





The glycaemic index of Manuka honey

February 2013 · e-SPEN Journal 8(1):e21–e24

DOI: 10.1016/j.clnme.2012.11.002

Lynne Chepulis · Evelyn Francis

Glycemic Index and Fructose Content of Honey

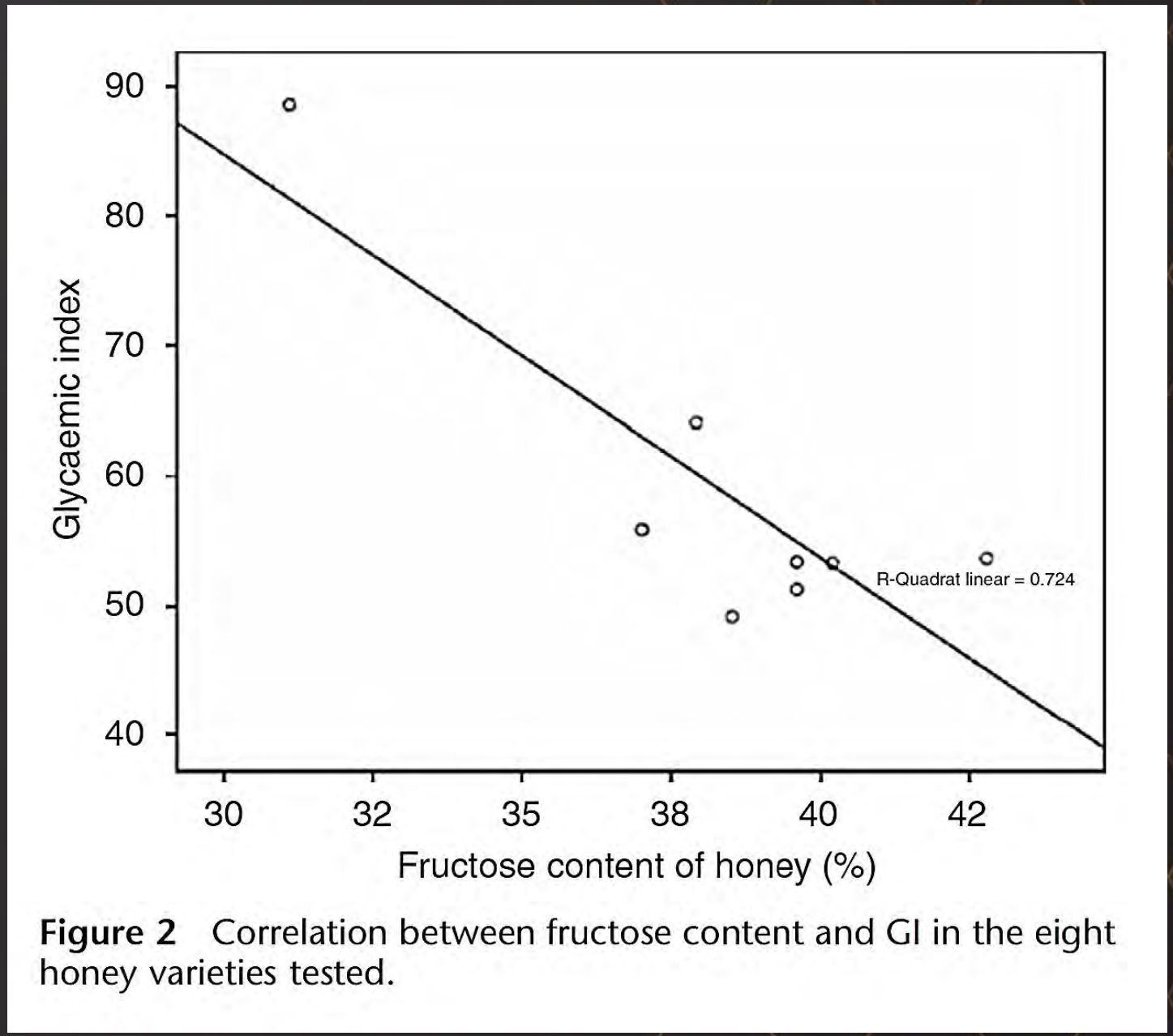


Figure 2 Correlation between fructose content and GI in the eight honey varieties tested.

Glycemic and Insulinemic Properties of Some German Honey Varieties

P Deibert, D Ko¨nig, B Kloock, M Groenefeld and A Berg

European Journal of Clinical Nutrition (2010) 64, 762–764

MEDICINAL HONEYS FROM DIFFERENT COUNTRIES

New Zealand

Manuka Honey

Buckwheat Honey

US and Canada

MEDICINAL HONEYS FROM DIFFERENT COUNTRIES

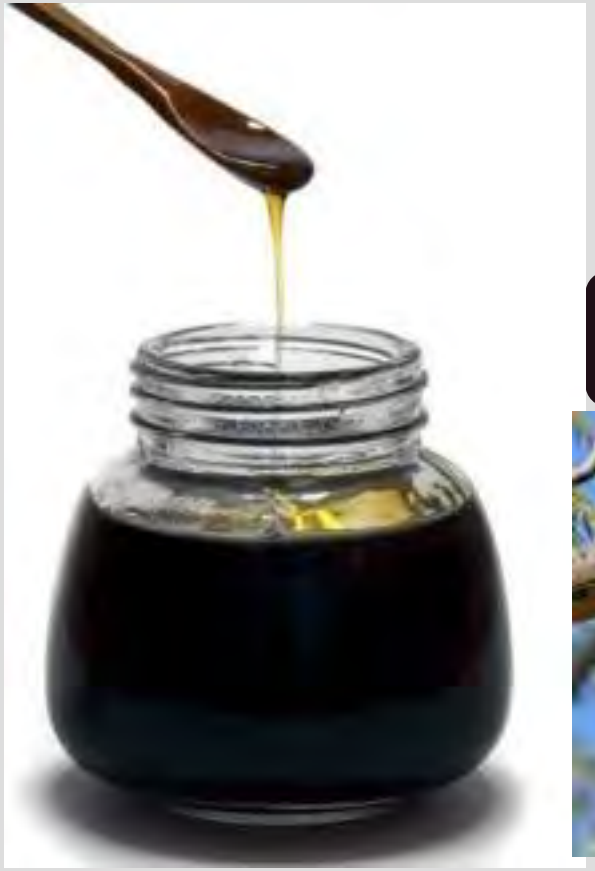
Chile

Ulmo Honey

Chestnut Honey

Turkiye

MEDICINAL HONEYS FROM DIFFERENT COUNTRIES



Tualang Honey

Malaysia

Sidr Honey

Yemen / Saudi Arabia / Pakistan

MEDICINAL HONEYS FROM DIFFERENT COUNTRIES

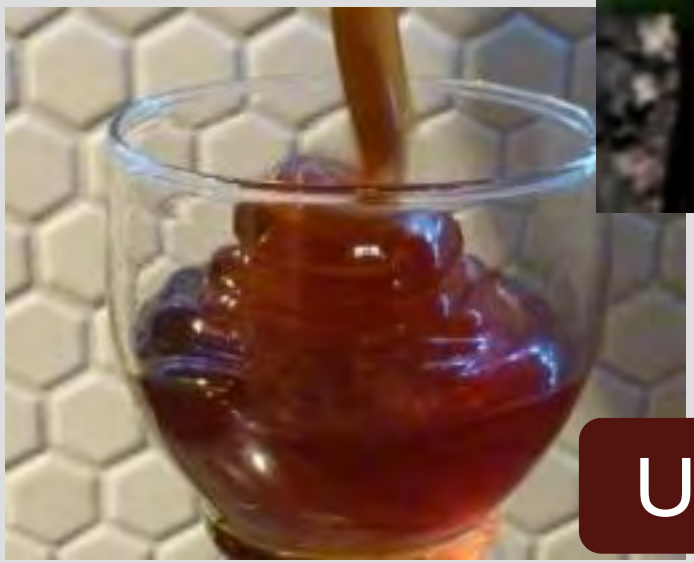
Oak Honey

Balkans / US

Jarrah Honey

Australia

MEDICINAL HONEYS FROM DIFFERENT COUNTRIES



Spotted Lantern Fly (SLF) Honey

US (Northeast)

Mad Honey

Turkiye / Nepal

4

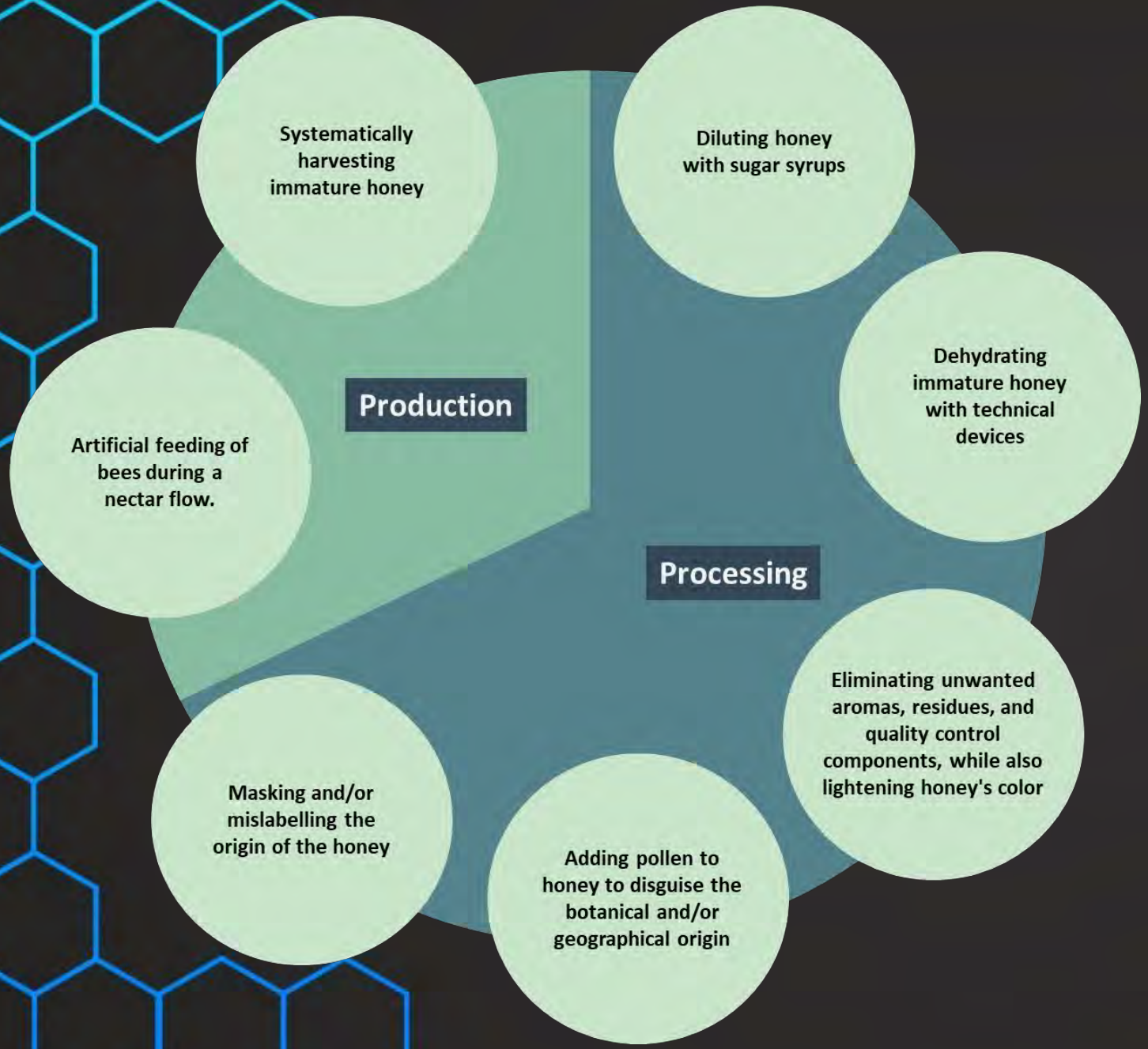
Clinical Applications

Cancer and Wound Healing

What is Medical-Grade Honey?

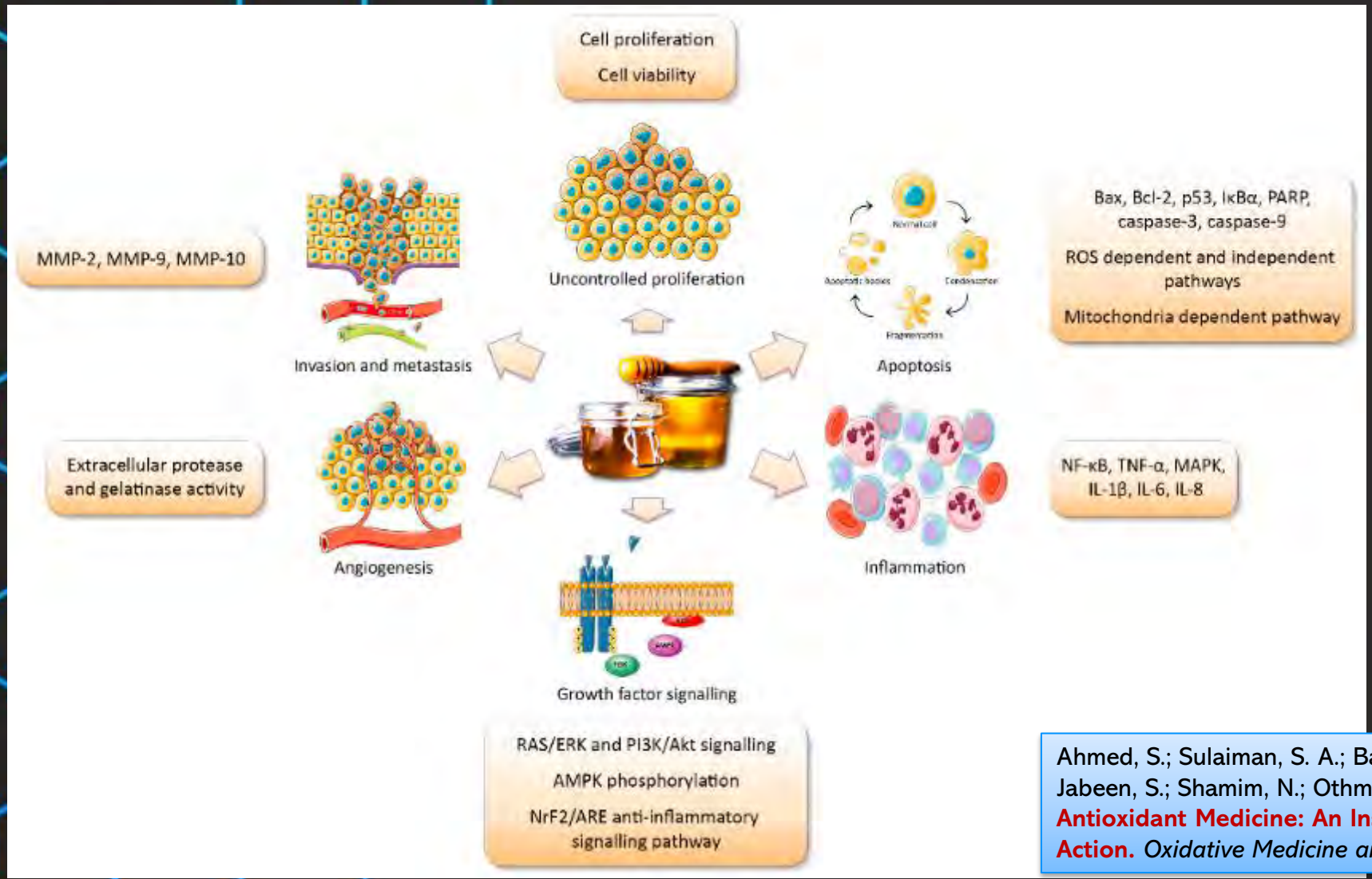
MGH

- Organic and free of contaminants and toxic substances
- Gamma sterilized to eliminate harmful microorganisms
- Safe for clinical implementation
- Follows production and storage standards, as well as legal and safety regulations
- Complies with physicochemical criteria for its effective use in wound care
- Must possess proven biological activity



Honey Violations and Adulterations

Honey as an Anticancer Agent



Anticancer activity has been proved against various types of cancer:

- Breast
- Colorectal
- Renal
- Prostate
- Endometrial
- Cervical and
- Oral

Ahmed, S.; Sulaiman, S. A.; Baig, A. A.; Ibrahim, M.; Liaqat, S.; Fatima, S.; Jabeen, S.; Shamim, N.; Othman, N. H. **Honey as a Potential Natural Antioxidant Medicine: An Insight into Its Molecular Mechanisms of Action.** *Oxidative Medicine and Cellular Longevity* **2018**, *2018*, 1–19.

Honey as an Anticancer Agent

Figure 1. Day 1: moist/dry desquamation is noted in a patient after 6 weeks of radiation therapy for breast cancer recurrence.

Figure 2. MEDIHONEY® HCS sheet dressings are initiated.

Figure 3. Day 2 of treatment: impressive healing after just 24 hours. The desquamation was completely resolved after 3 more days of treatment.

Milka Madhale
Rekha Ramanath

A Honey: Treatment for Radiation Induced Mucositis

Impact of Honey on Radiation Induced Mucositis

LAP LAMBERT Academic Publishing

Figure 1. Case 1: Left breast.

Figure 1a. Fungating tumor wound with large amount of slough, exudate, and pain and severe malodor. ALH dressing initiated.

Figure 1b. After 1 week, a large amount of slough has been debrided. Exudate is reduced and malodor has been completely eradicated. The dressings soothed topical pain at the wound edges and the dressing change procedure is pain-free.

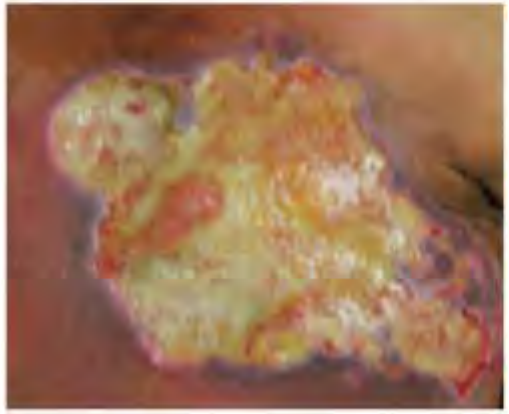


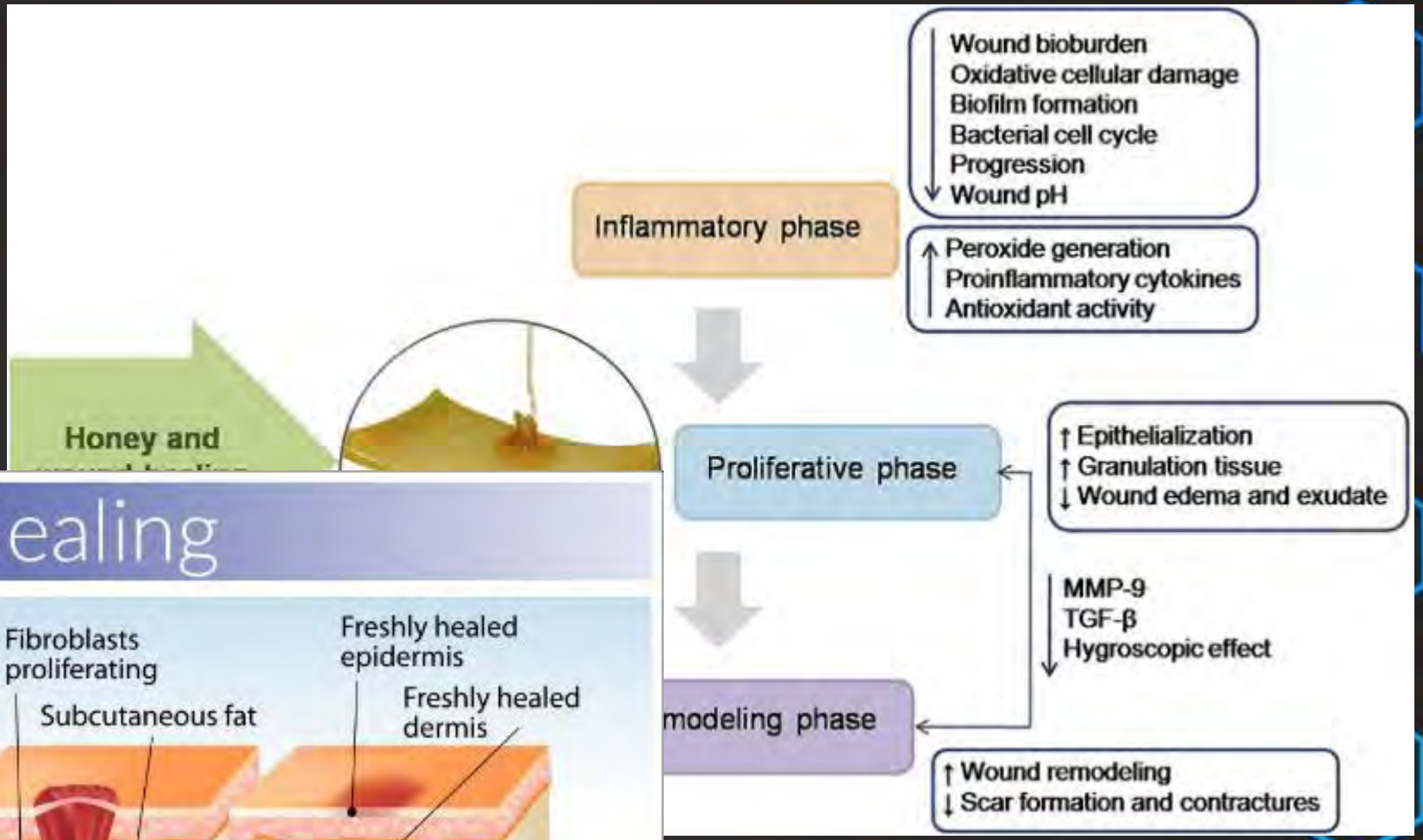
Figure 1c. The patient continues to use the ALH dressings to manage exudates and slough while receiving chemotherapy and radiation.

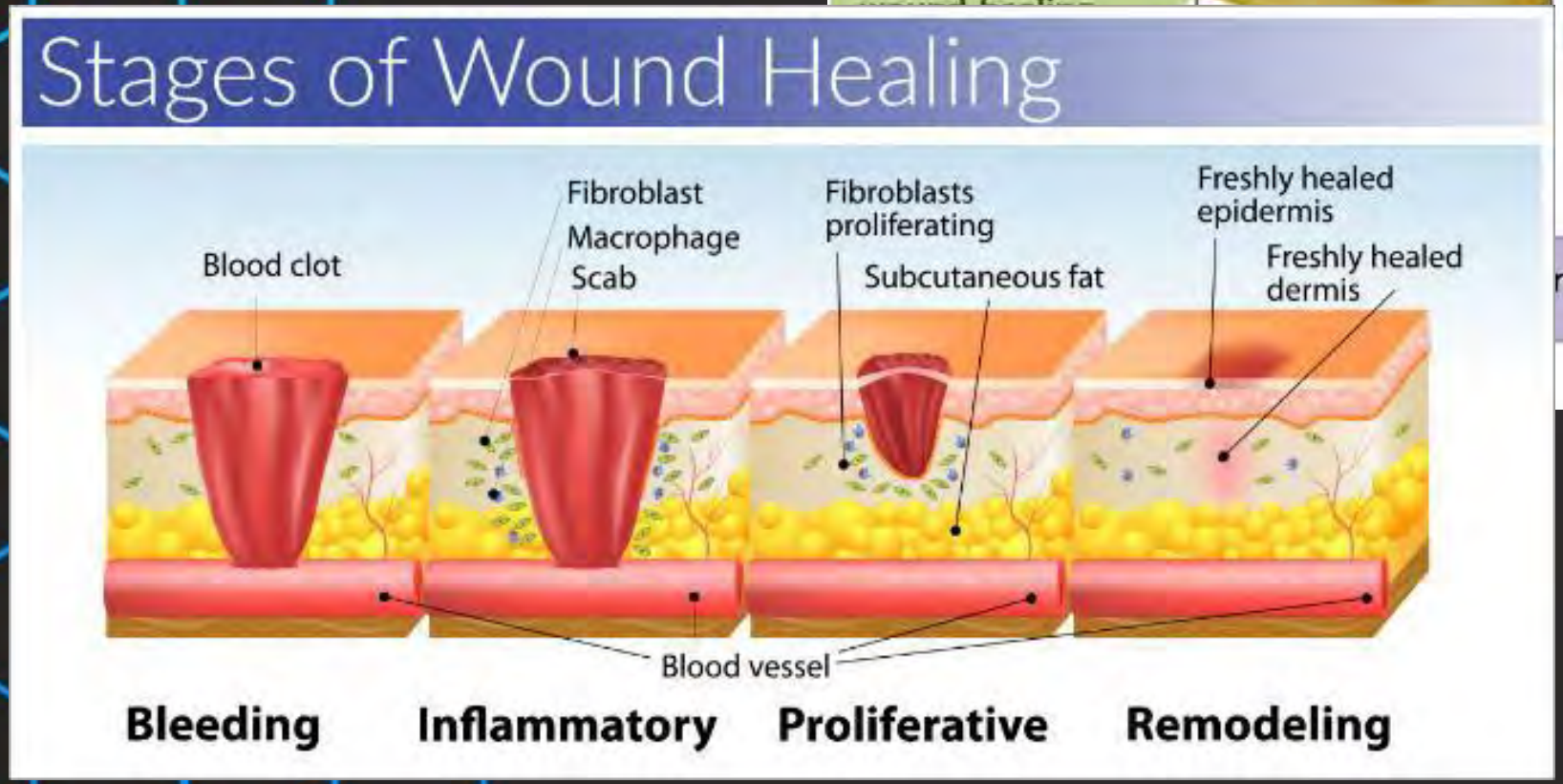
Figure 1d. Slough and granulation tissue cover 60% and 40% of the wound, respectively. The wound has gradually decreased in size, exudate is minimal, and there is no malodor.

COLUMN
The Clinical Benefits of Active Leptospermum Honey in Oncologic Wounds

Volume 56 - Issue 10 - October, 2010

Honey for Wound Healing





Bahari, N.; Hashim, N.; Md Akim, A.; Maringgal, B. **Recent Advances in Honey-Based Nanoparticles for Wound Dressing: A Review**. *Nanomaterials* **2022**, *12*, 2560.

Honey for Wound Healing

Scepankova, H.; Combarros-Fuertes, P.; Fresno, J.M.; Tornadijo, M.E.; Dias, M.S.; Pinto, C.A.; Saraiva, J.A.; Estevinho, L.M.
Role of Honey in Advanced Wound Care
Molecules 2021, 26, 4784.
https://doi.org/10.3390/molecules26164784

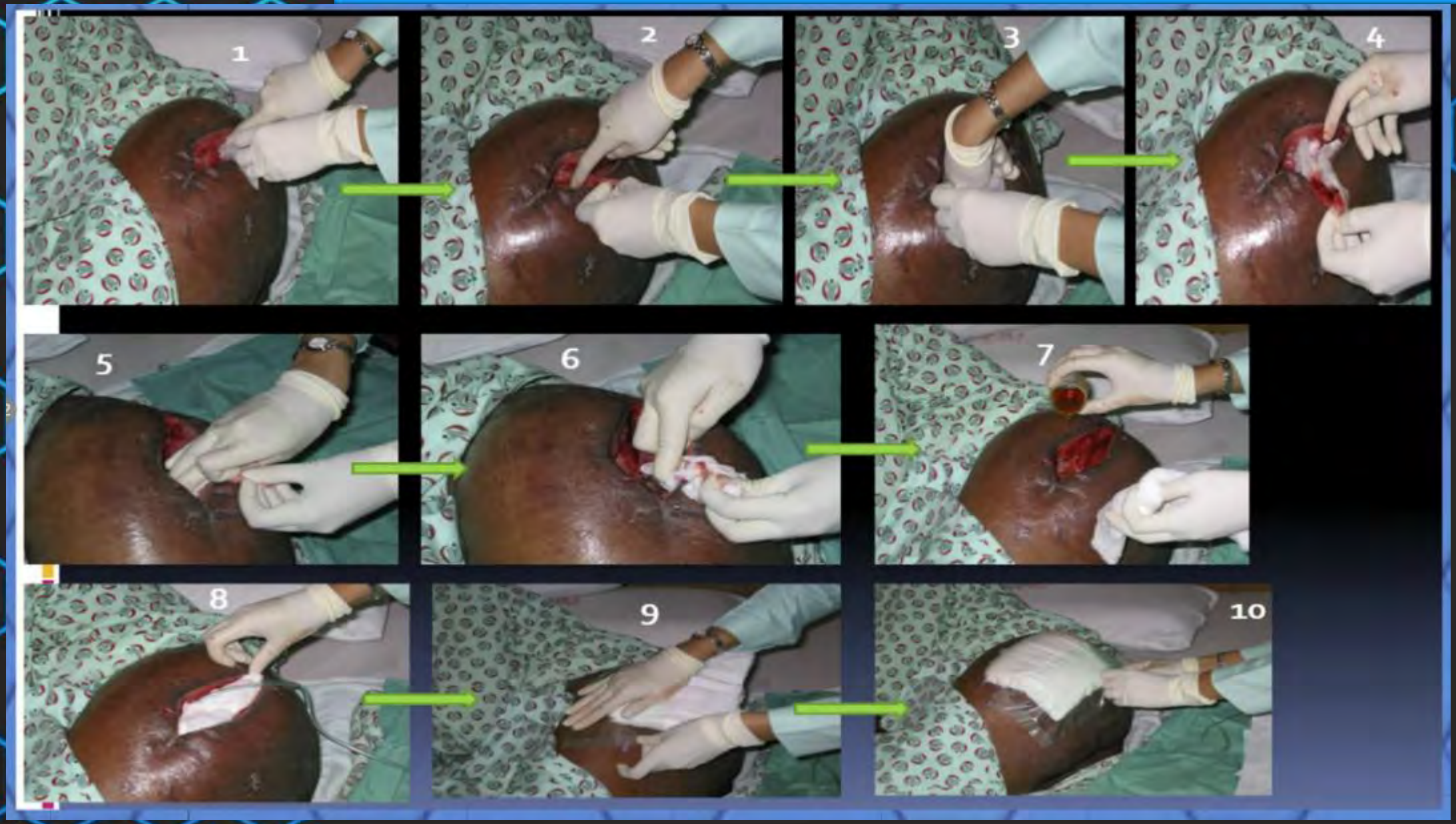
Several case studies and randomized controlled trials

- Amputation wounds
- Burns
- Surgical Wounds
- Skin grafting sites
- Skin lesions

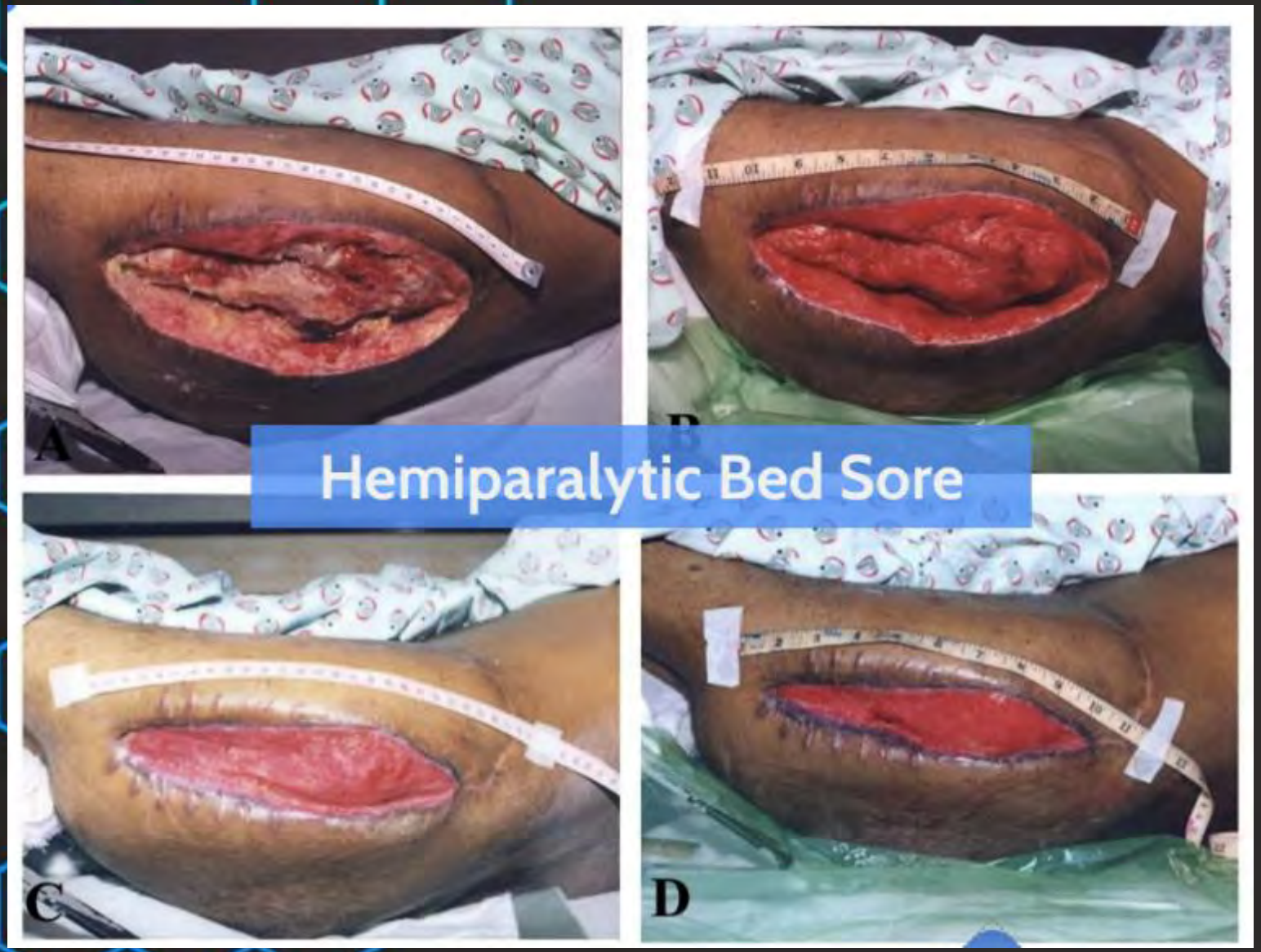
- Skin ulcers
  - Leg
  - Varicose
  - Malignant
  - Diabetic


WARNING
GRAPHIC CONTENT

Honey Application for Wound Healing



Clinical Trial (Univ of Malaysia)



Hemiparalytic Bed Sore

- Chronic non healing Diabetic Wound with multiple amputations.
- 26-year-old male
- Referred post disarticulation of right hip for non healing wound for past 2 years on conventional Rx.

Diabetic Wound

40 years old male; traumatic laceration on the lateral aspect upper arm

Sword Slice

Personal Anectode (Austin, TX)

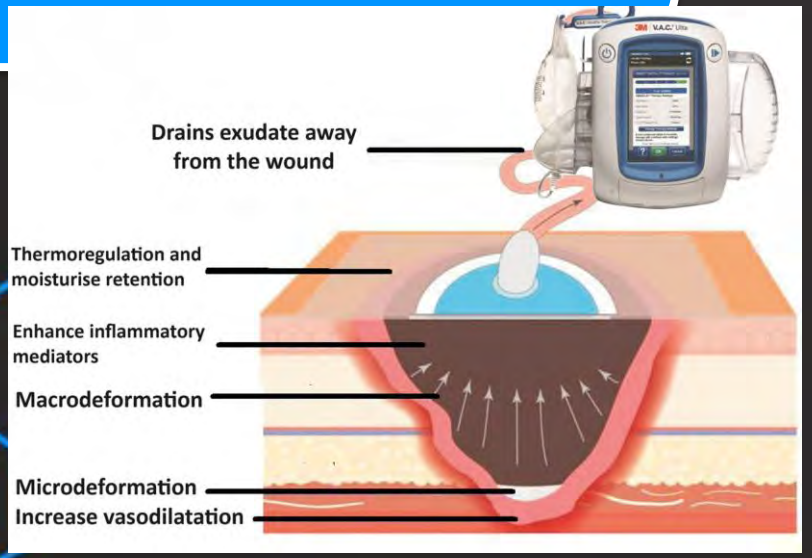
9-yo Female
Neuropathic Ulcer

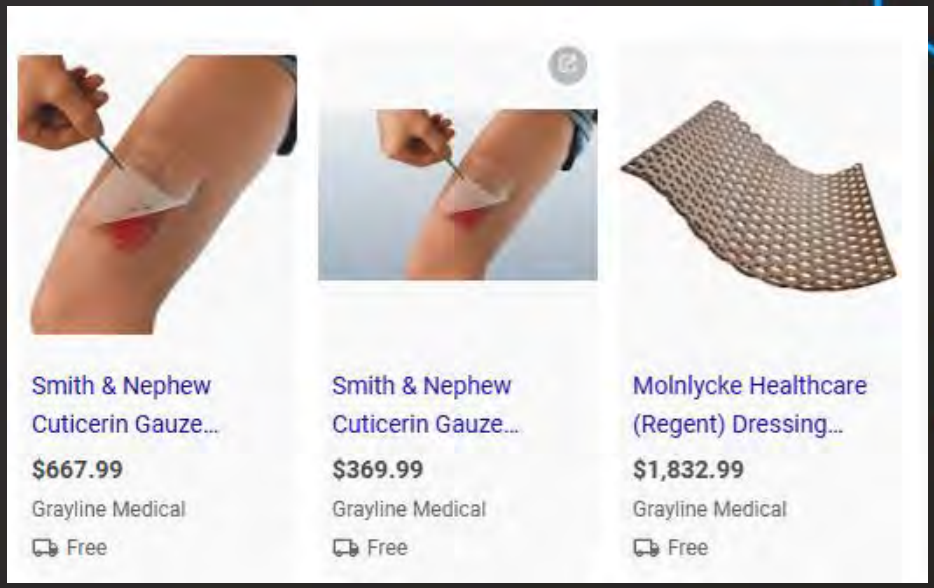
Medical-Grade
SLF Honey

F. Ozturk, Ph.D.

Common Burn Wound Treatments

- Active hydrogels
- Chitin-based dressings
- Negative pressure wound therapy (NPWT)
- Honey-based dressings





Common Burn Wound Treatments

- Regenerative medicine
- Tissue engineering products
- Larval debridement therapy (using *Lucilia sericata*)
- Use of fish skin

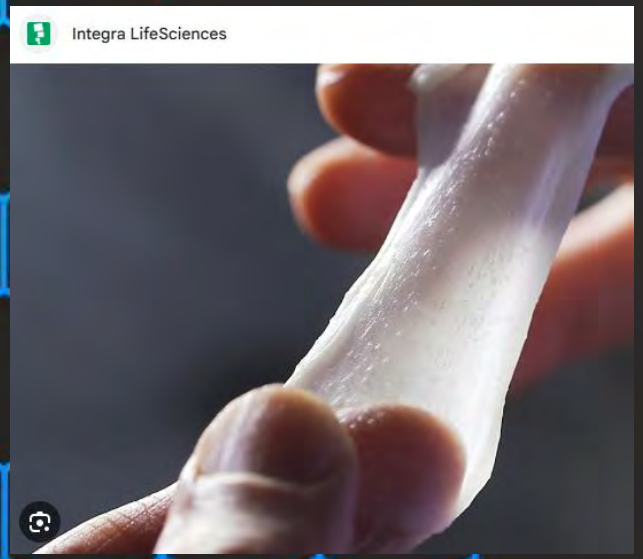


Figure 6. Larvae on the wound (Picture with permission of Julie Evans).

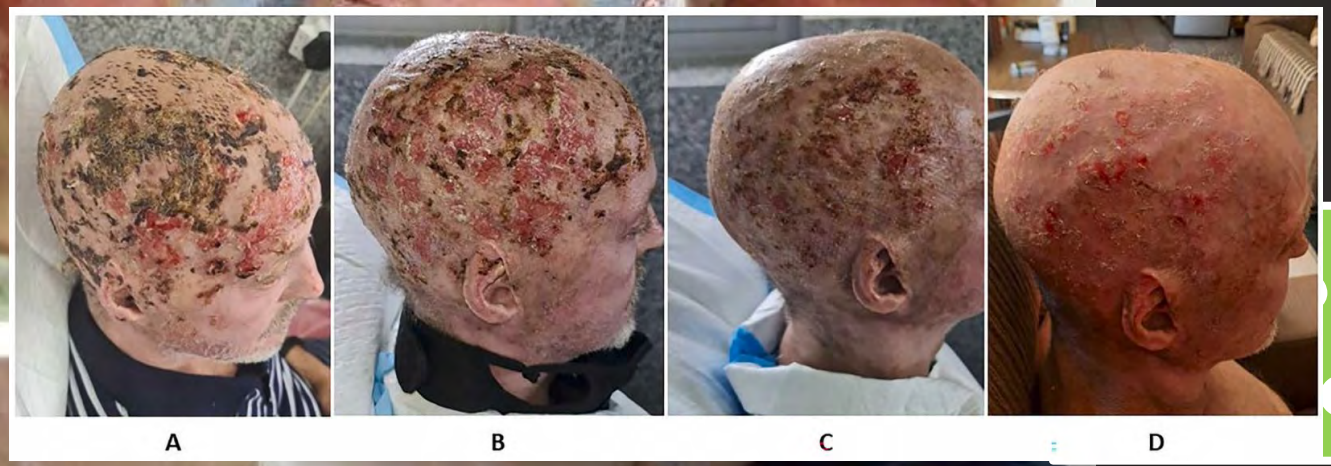
HEALTH

300+ burn victims treated with tilapia skin in Ceará since 2016

With no cases of rejection or infection, the data demonstrate the procedure's success, which also reduces pain for the burn victims, treatment time, and hospital expenses

Clinical and Animal Studies on Honey's Therapeutic Effects in Burn Wound Healing (2013-2024)

Honey Application for Burn Wounds

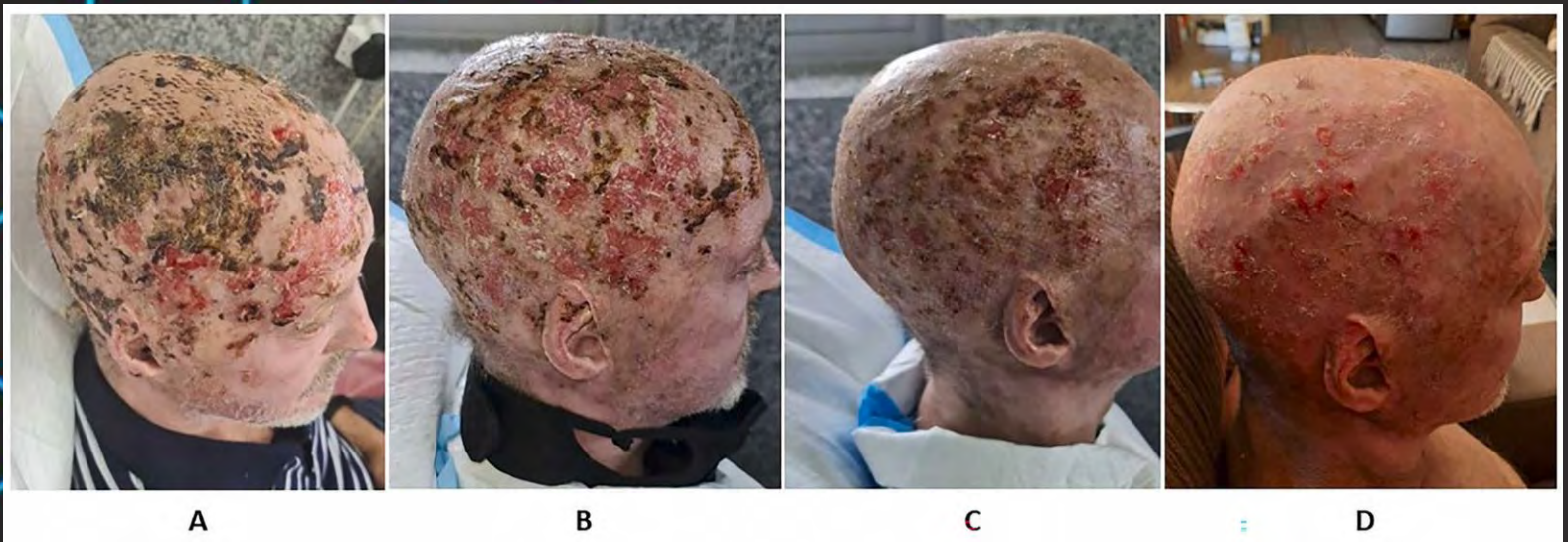


male infant
cald burn

L-Mesitran Ointment

E. Smaropoulos, MD PhD

Honey Application for Burn Wounds



57-yo male Electrical Burn

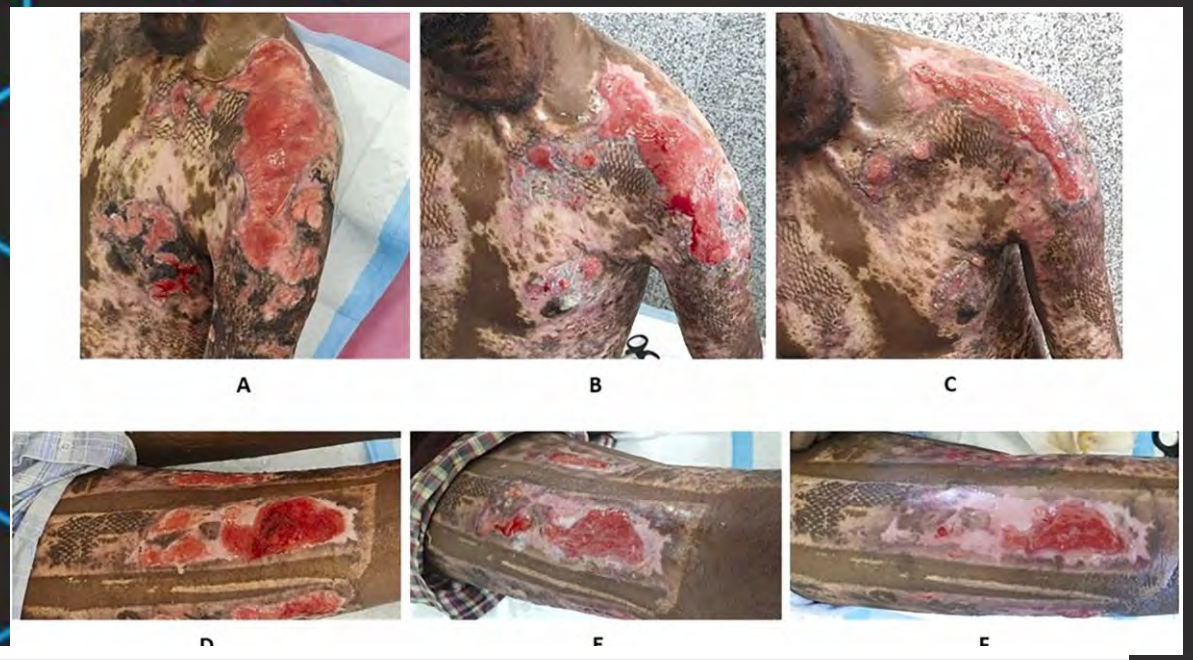
History of stage IV melanoma

confirmed infection with E. coli and P. aeruginosa

Comparing the antibacterial and healing properties of medical-grade honey and silver-based wound care products in burns

Bouke K.H.L. Boekema [a b], Daniela Chrysostomou [c d e], Guido Ciprandi [f], Anouk Elgersma [a], Marcel Vlig [a], Andrea Pokorná [d e g], Linsey J.F. Peters [h], Niels A.J. Cremers [h i]

Honey Application for Burn Wounds



Comparing the antibacterial and healing properties of medical-grade honey and silver-based wound care products in burns

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27-yo mala Scald Burn (Steam)

Upper arm and both thighs (skin graft)

confirmed infection with E. feacelis and P. aeruginosa

5

Honey in the Medical Market

GMI Global Market Insights

WOUND CARE MARKET

MARKET STATISTICS

Market Size (2022)

$21.2 Bn

CAGR (2023-2032)

5.9%

Market Value (2032)

$37.3 Bn

MARKET SEGMENTATION
Market Value (2022)

Advanced Wound Dressing Segment	**$6 Bn**
Acute Wounds Segment	**$11.9 Bn**
Hospitals Segment	**$8 Bn**

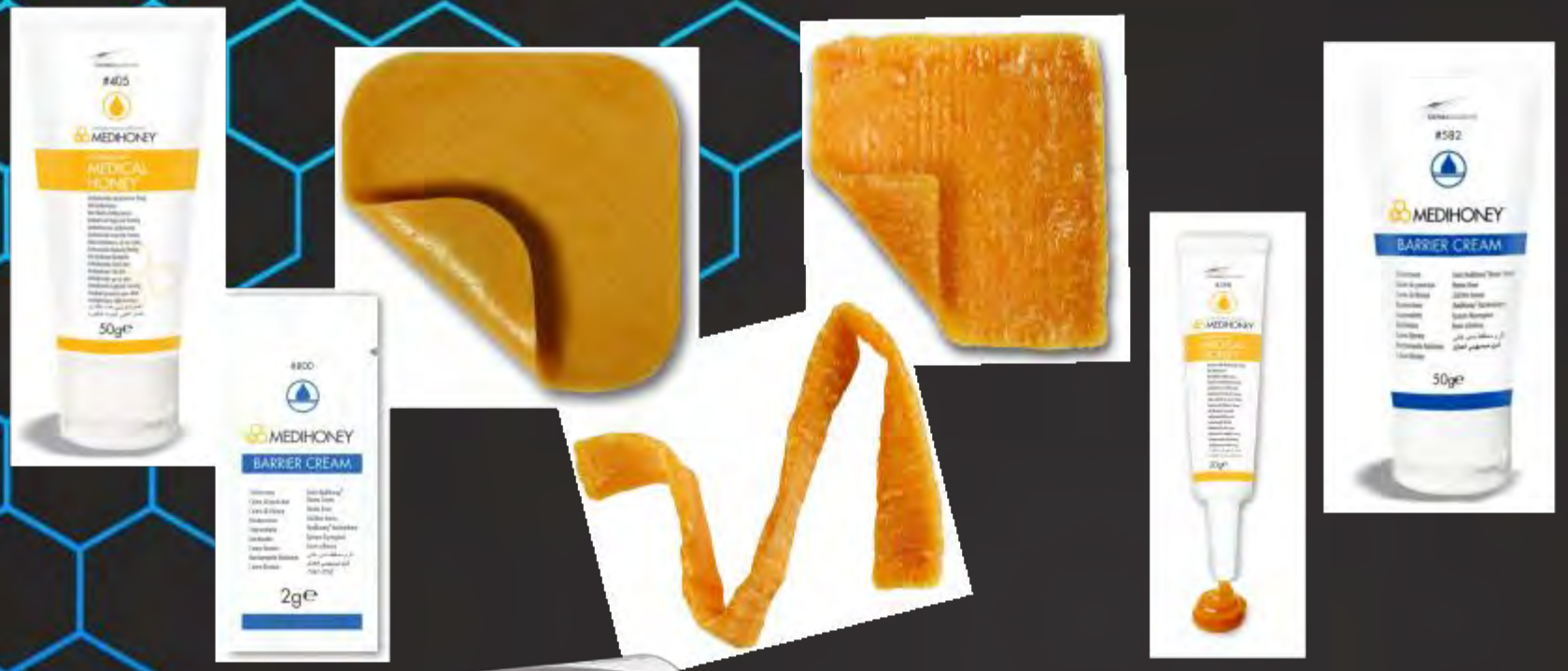
REGIONAL ANALYSIS
Market Size (2022)

United States

$8 Bn

Table. Medical Grade Honey (MGH) wound care products currently available on the market

Product name	Manufacturer	Honey type	MGH content	Sterilization method	Certification	Supplements
Activon	Advancis	Manuka	100%	Gamma irradiation	FDA & CE	-
L-Mesitran	Triticum	Organic	40 and 48%	Gamma irradiation	FDA & CE	Vitamins C and E, zinc oxide, essential oils
Manuka Fill	Links Medical Products Inc.	Manuka	100%	Gamma irradiation	FDA & CE	-
Medihoney	Derma Sciences	Manuka	80%	Gamma irradiation	FDA & CE	-
Melladerm Plus	SanoMed Manufacturing	Polyfloral	45%	Ozonation	CE	Vitamins C and E, glucose oxidase
Principelle IF	Principelle	Dark buckwheat	n.a.	Gamma irradiation	CE	Minerals, trace elements, oxides
Revamil	Bfactory Health Products	Polyfloral	100%	Gamma irradiation	CE	-
Surgihoney	Matoke Holdings	Any honey	100%	Heated	CE	Glucose oxidase
Therahoney	Medline	Manuka	100%	Gamma irradiation	FDA	-
Vivamel	Tosama	Chestnut	100%	Gamma irradiation	CE	-
Meletus	Melipharm	Mix of monoflorals	100%	Gamma irradiation	CE	-



- Hydrogel
- Hydrocolloid
- Alginate
- Paste
- Ointment
- Gel

MGH Wound Products

MDM
WOUND VENTURES

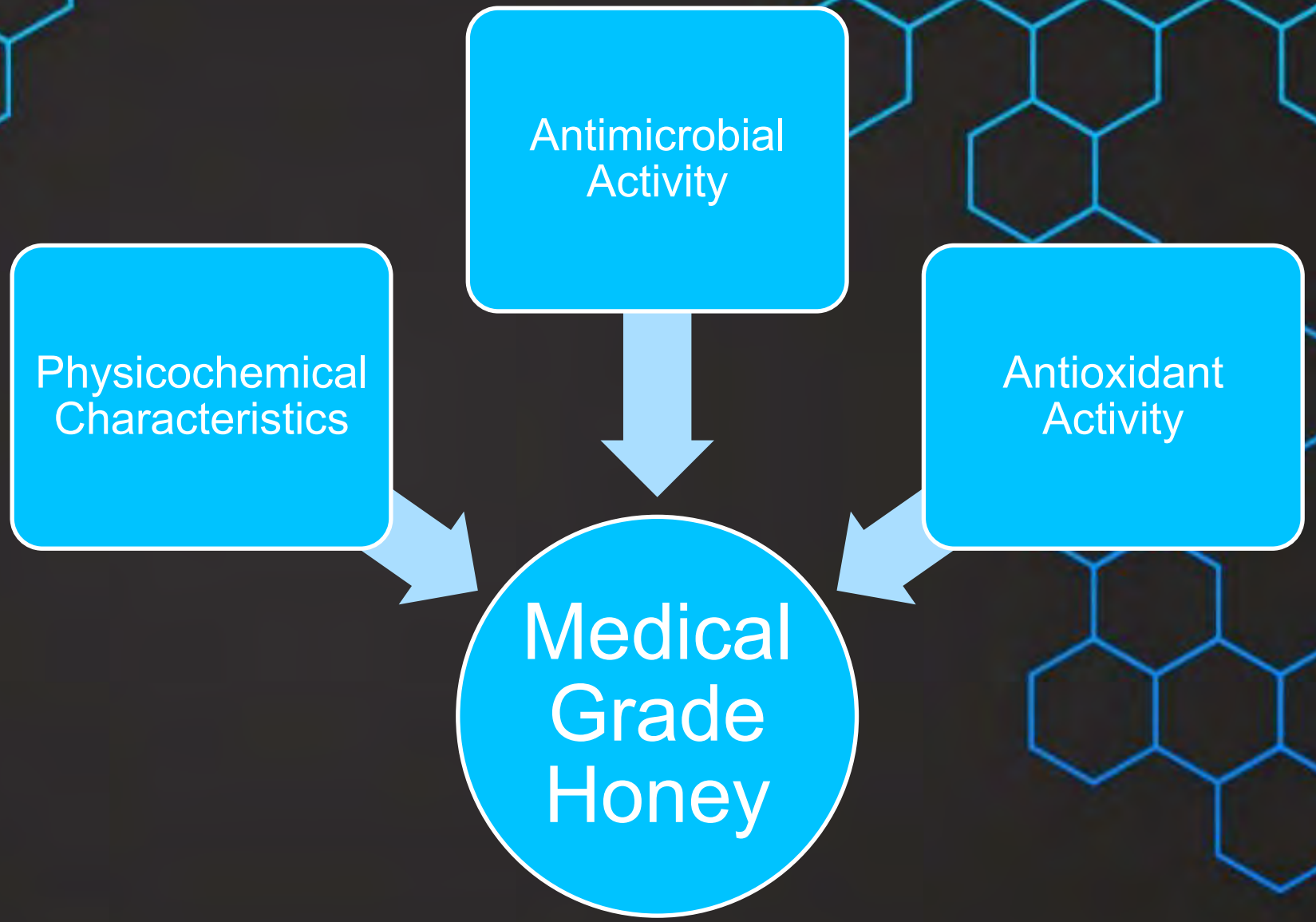
San Antonio, TX

EZ HONEY

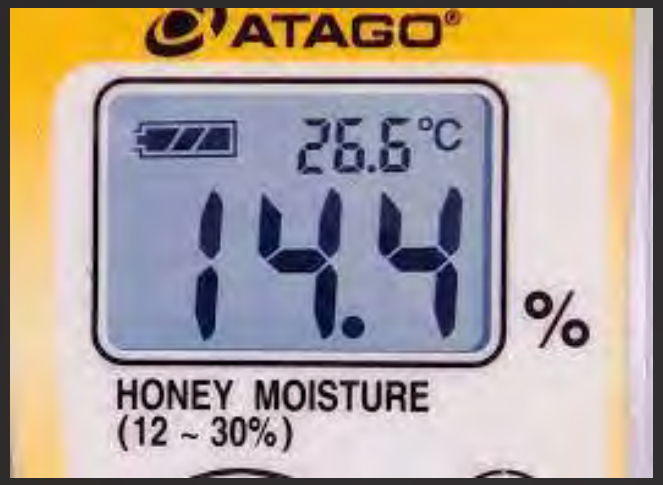
6

Local Medical Grade Honeys

How to Identify Medical Grade Honey?



Physicochemical Analyses



Antimicrobial Analysis of Honey

Agar Well Diffusion Assay

Hydrogen Peroxide Activity

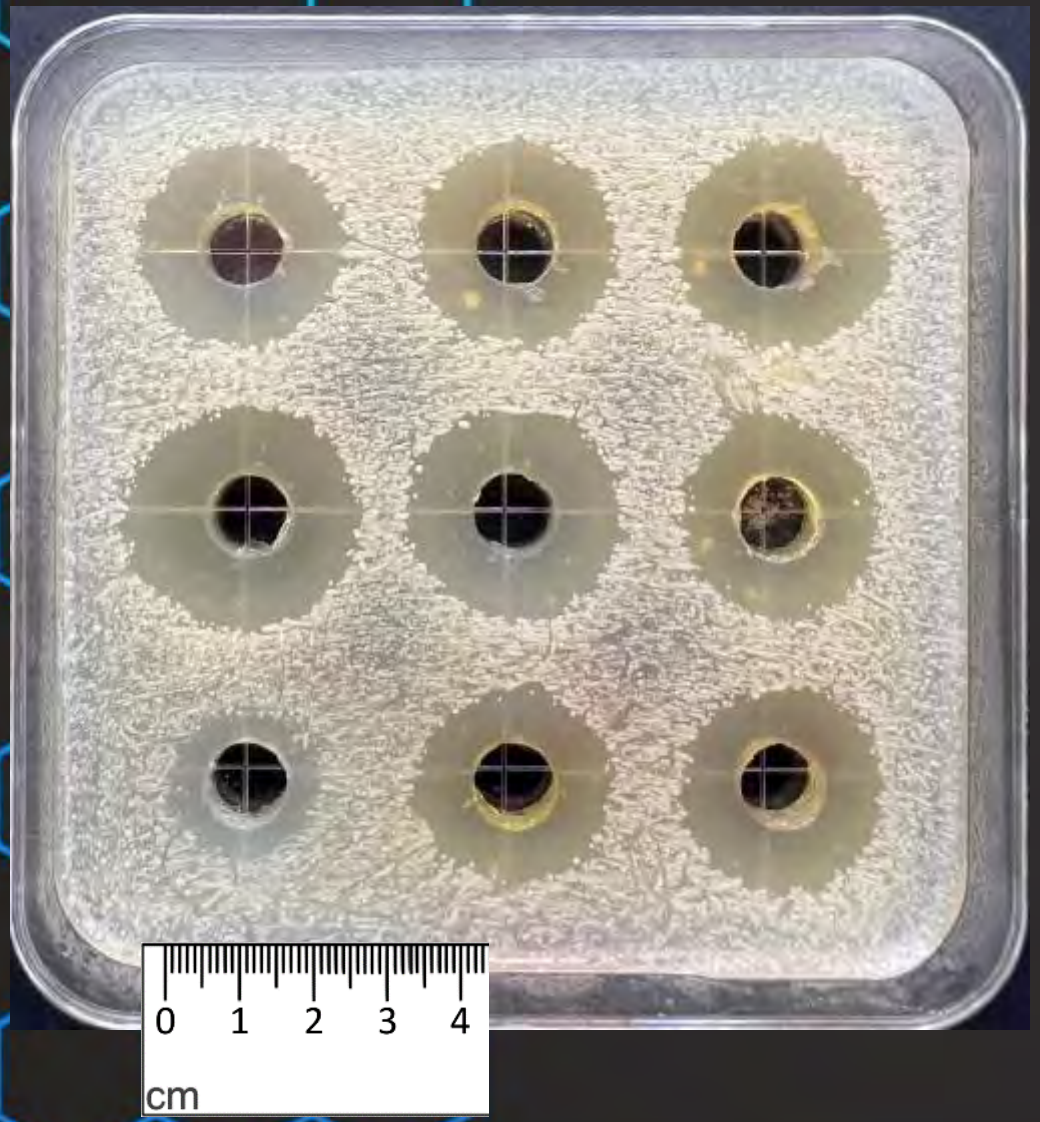
XTT Metabolic Assay

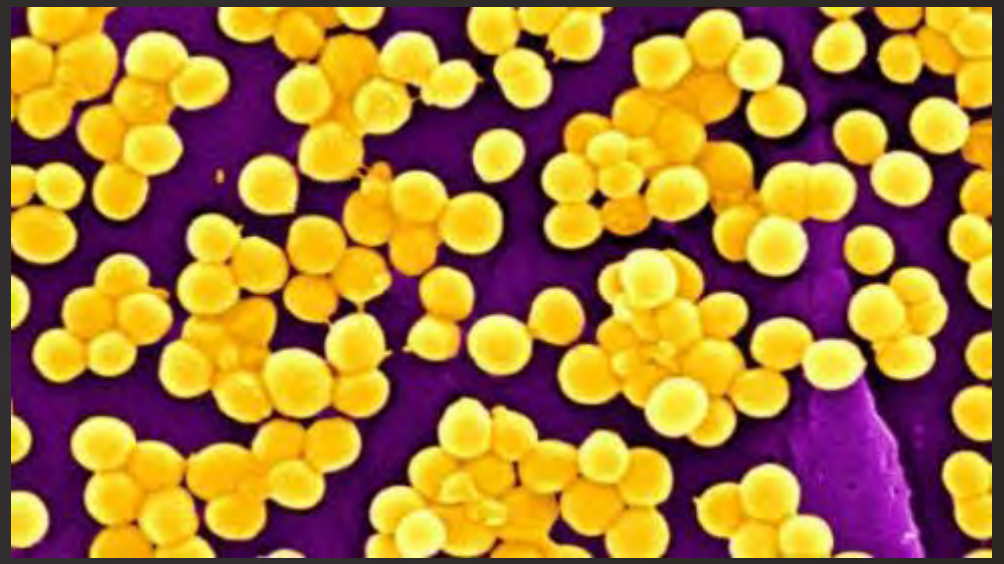
Cell Proliferation and Viability

Disk Diffusion Assay

Prevention of Biofilm Formation

Agar Well Diffusion Assay of Honey

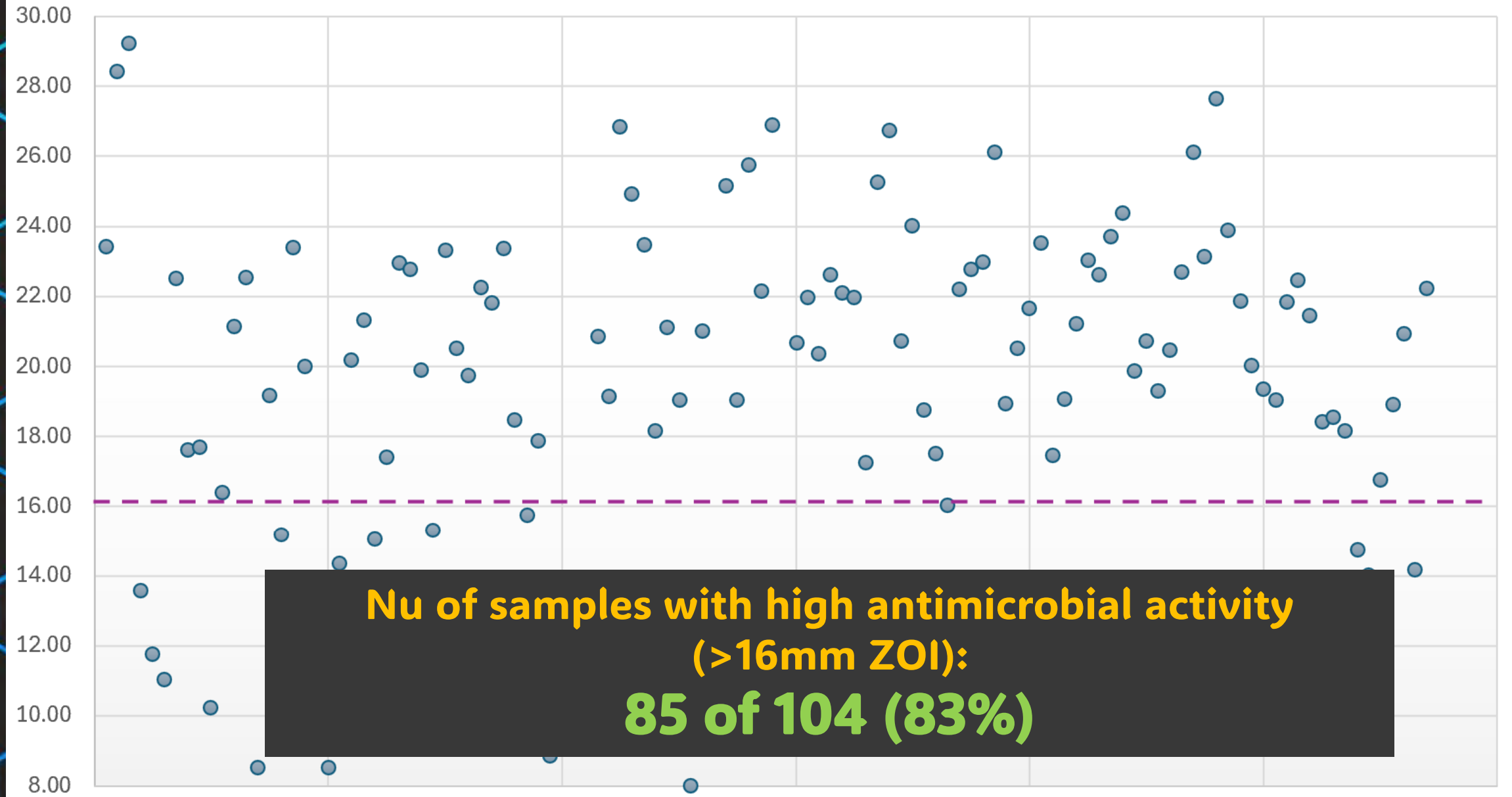




Staphylococcus aureus

Zone of Inhibition (ZoI)
Weak: < 11 mm
Moderate: ≤16 mm
Strong: >16 mm

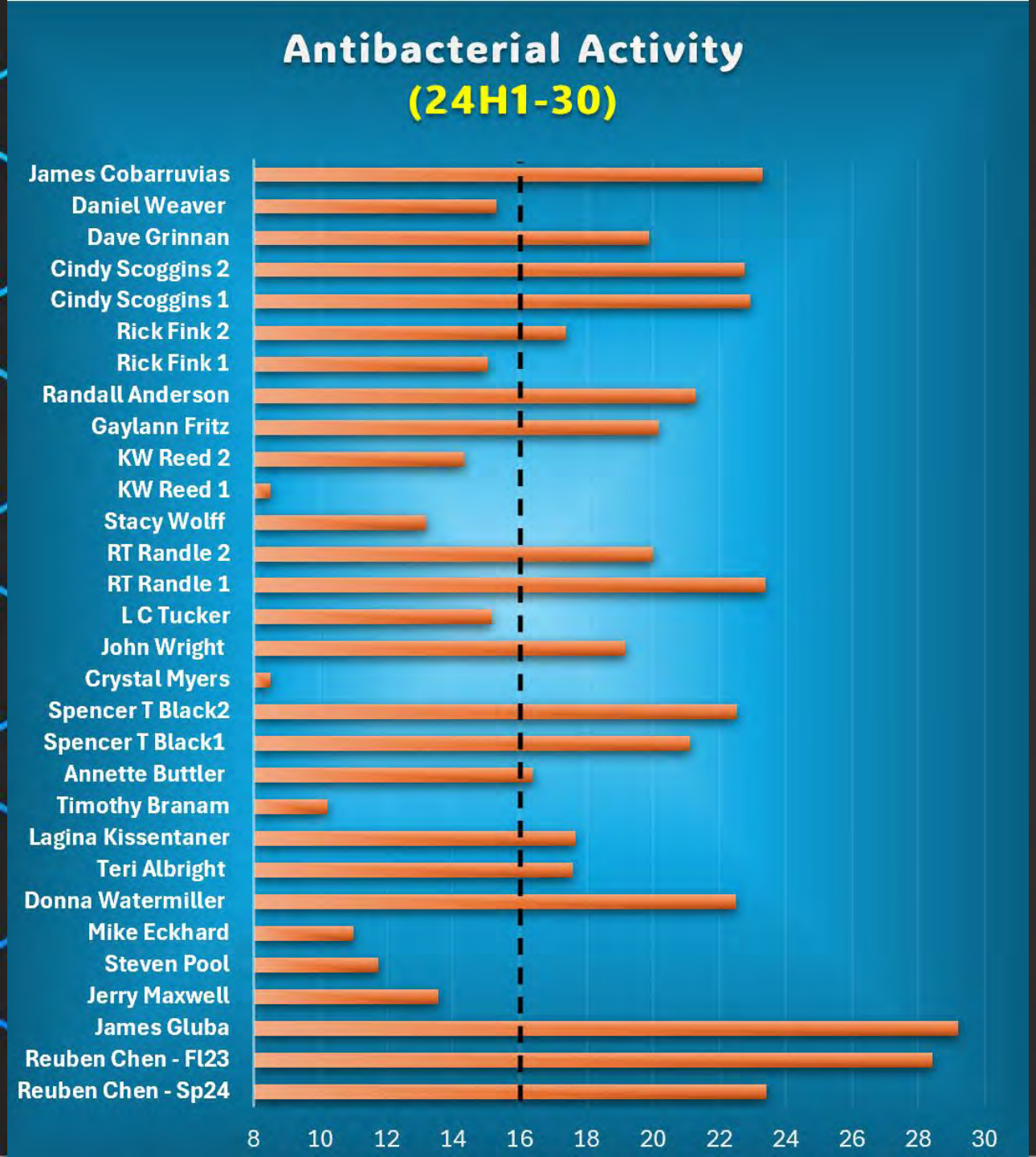
Antimicrobial Activity of TX Honeys (Fall 24)



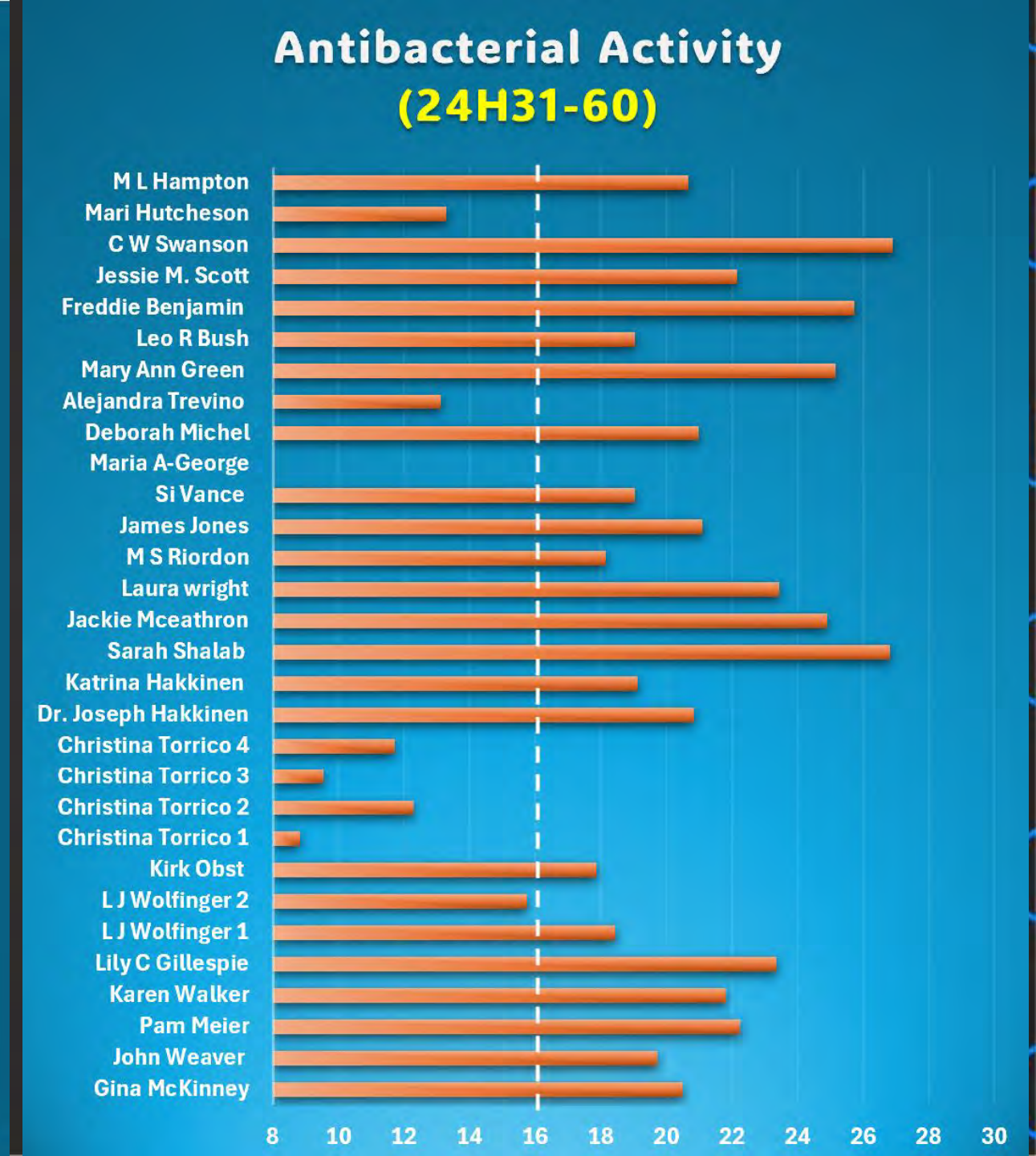
Nu of samples with high antimicrobial activity (>16mm ZOI):

85 of 104 (83%)

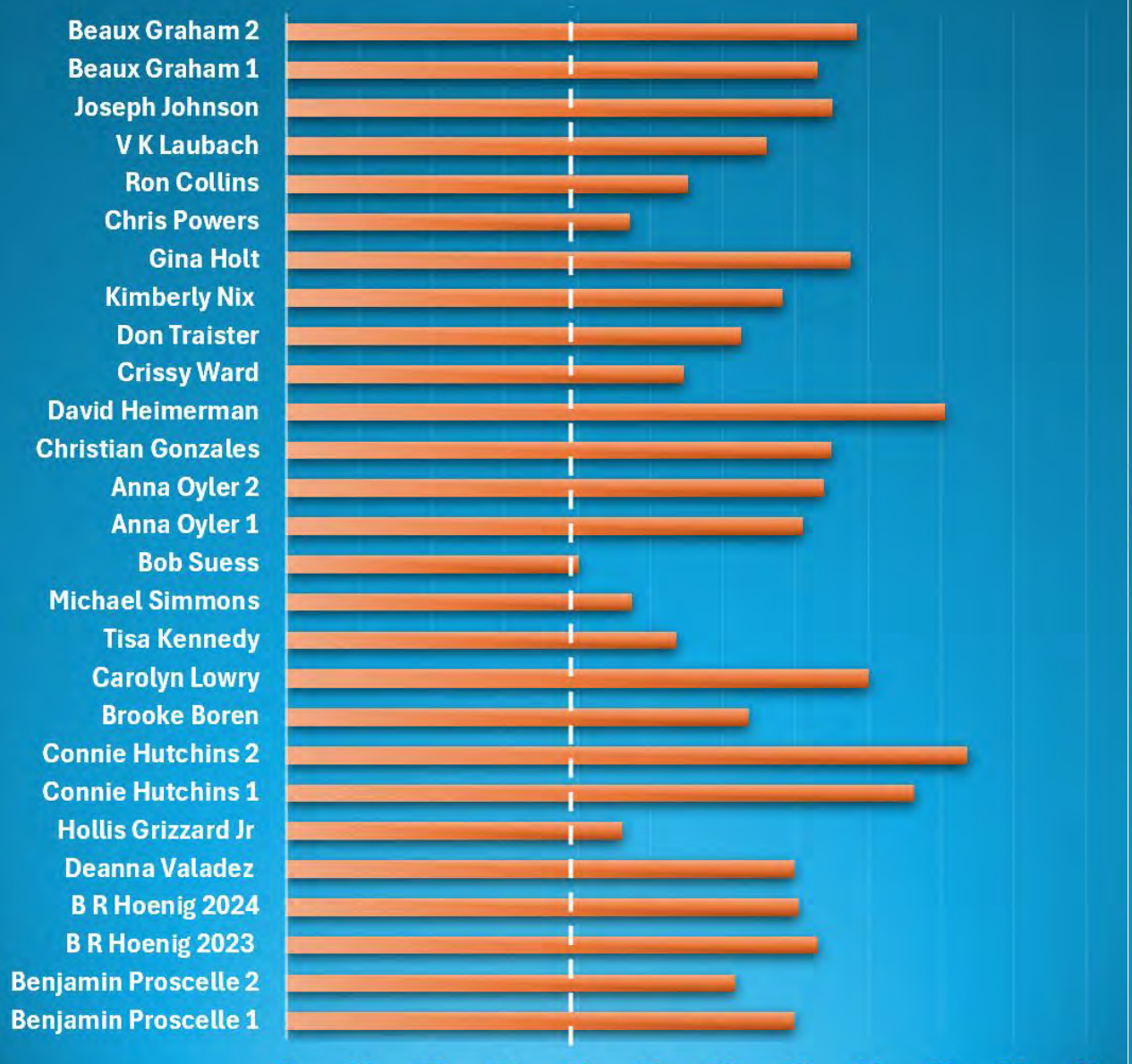
Antibacterial Activity (24H1-30)



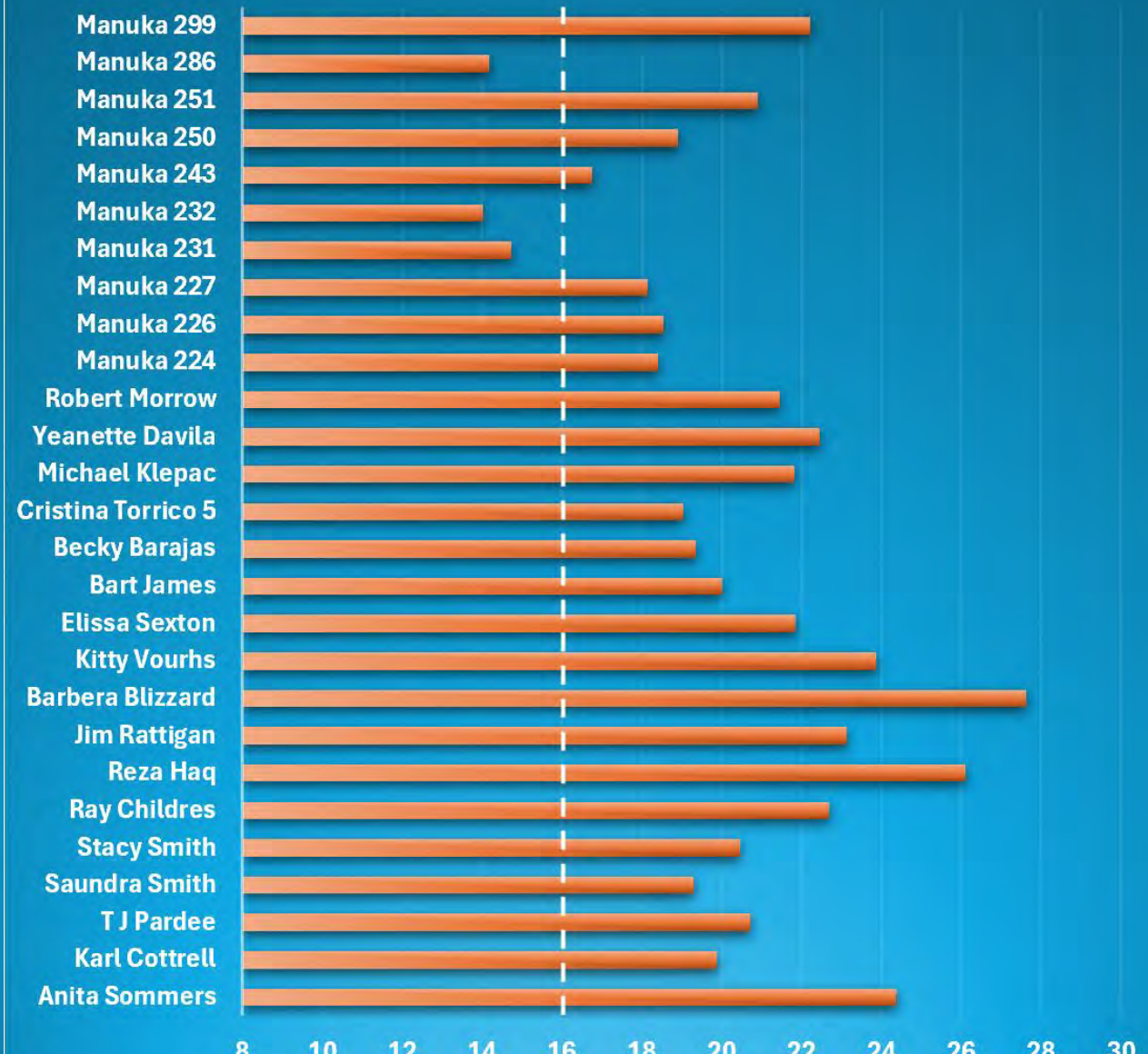
Antibacterial Activity (24H31-60)



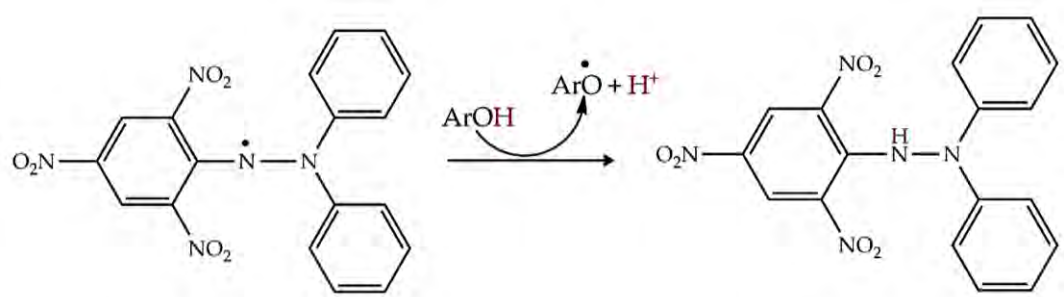
Antibacterial Activity (24H61-90)



Antibacterial Activity (24H92 & Manuka)

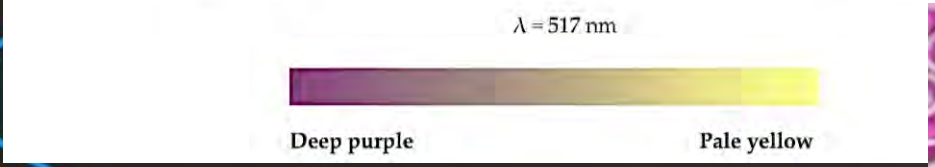


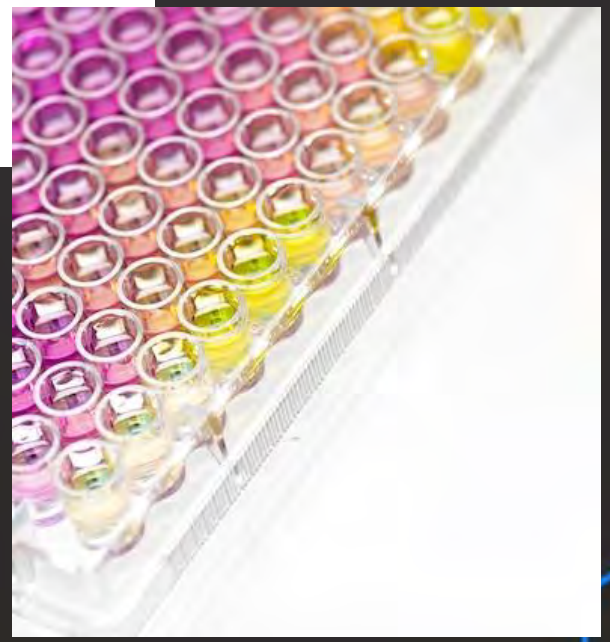
Antioxidant Analysis of TX Honey

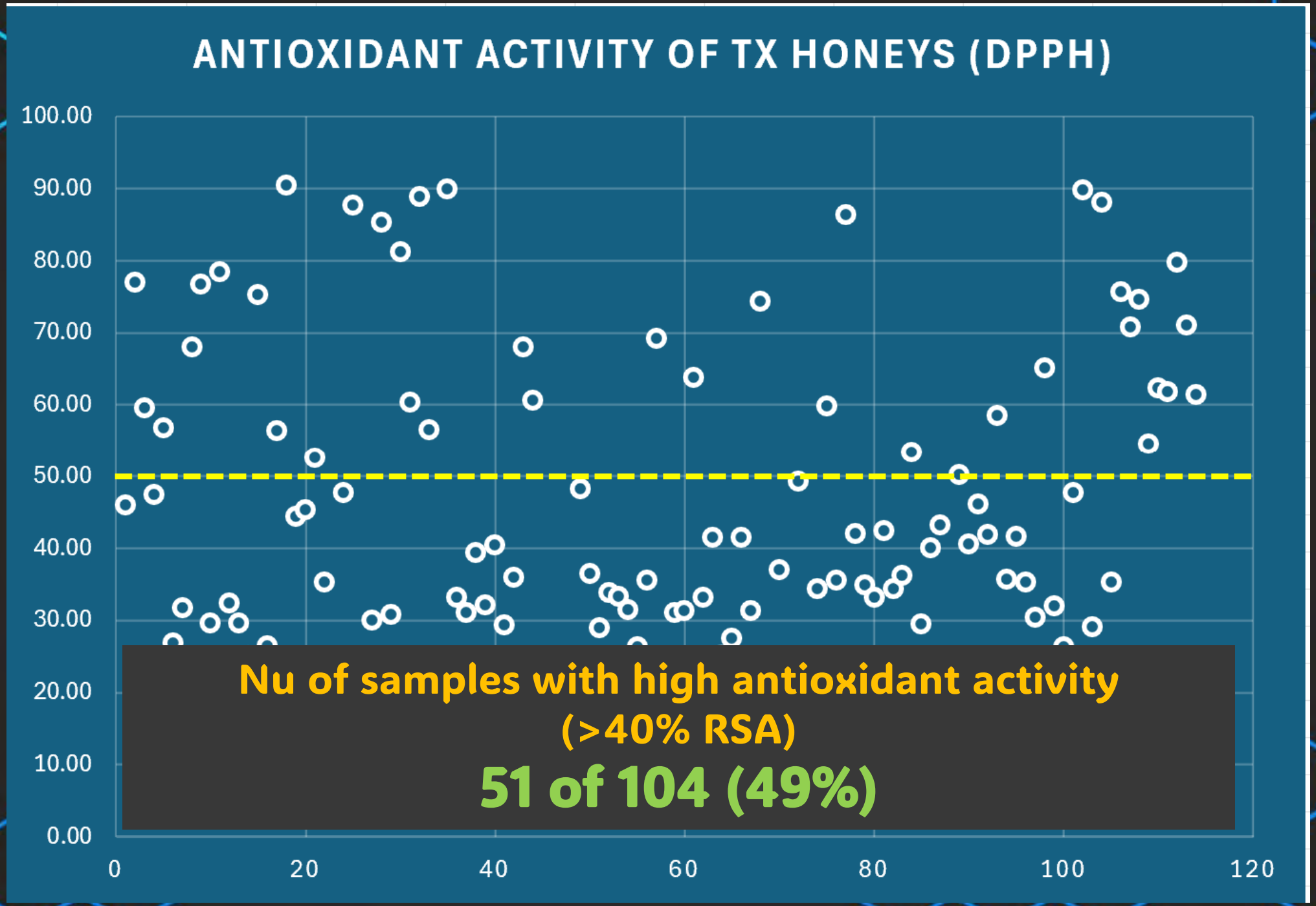


Deep purple
2, 2-diphenyl-1-picrylhydrazyl
(DPPH)

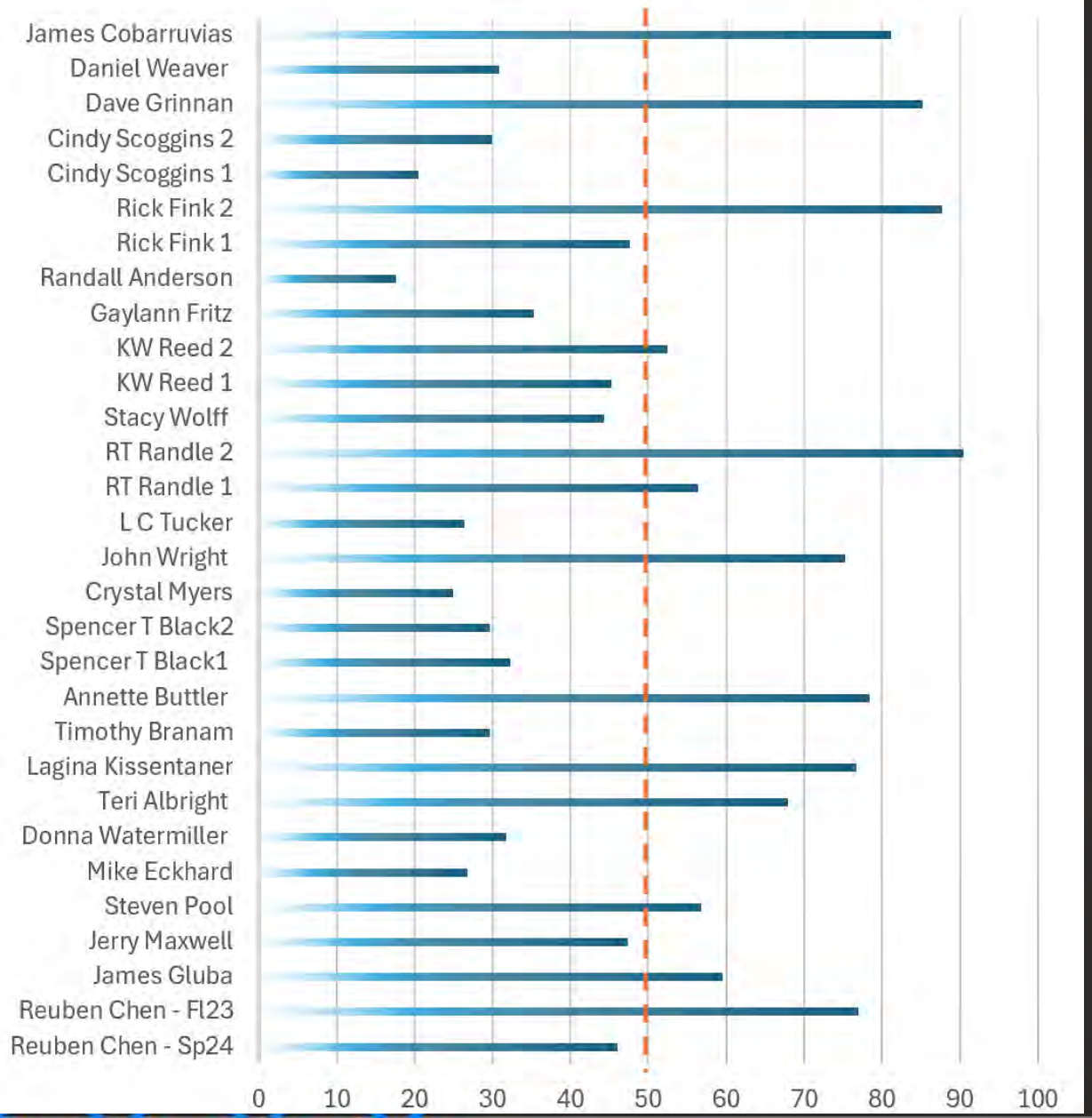
Pale yellow
2, 2-diphenyl-1-picrylhydrazine
(DPPH-H)



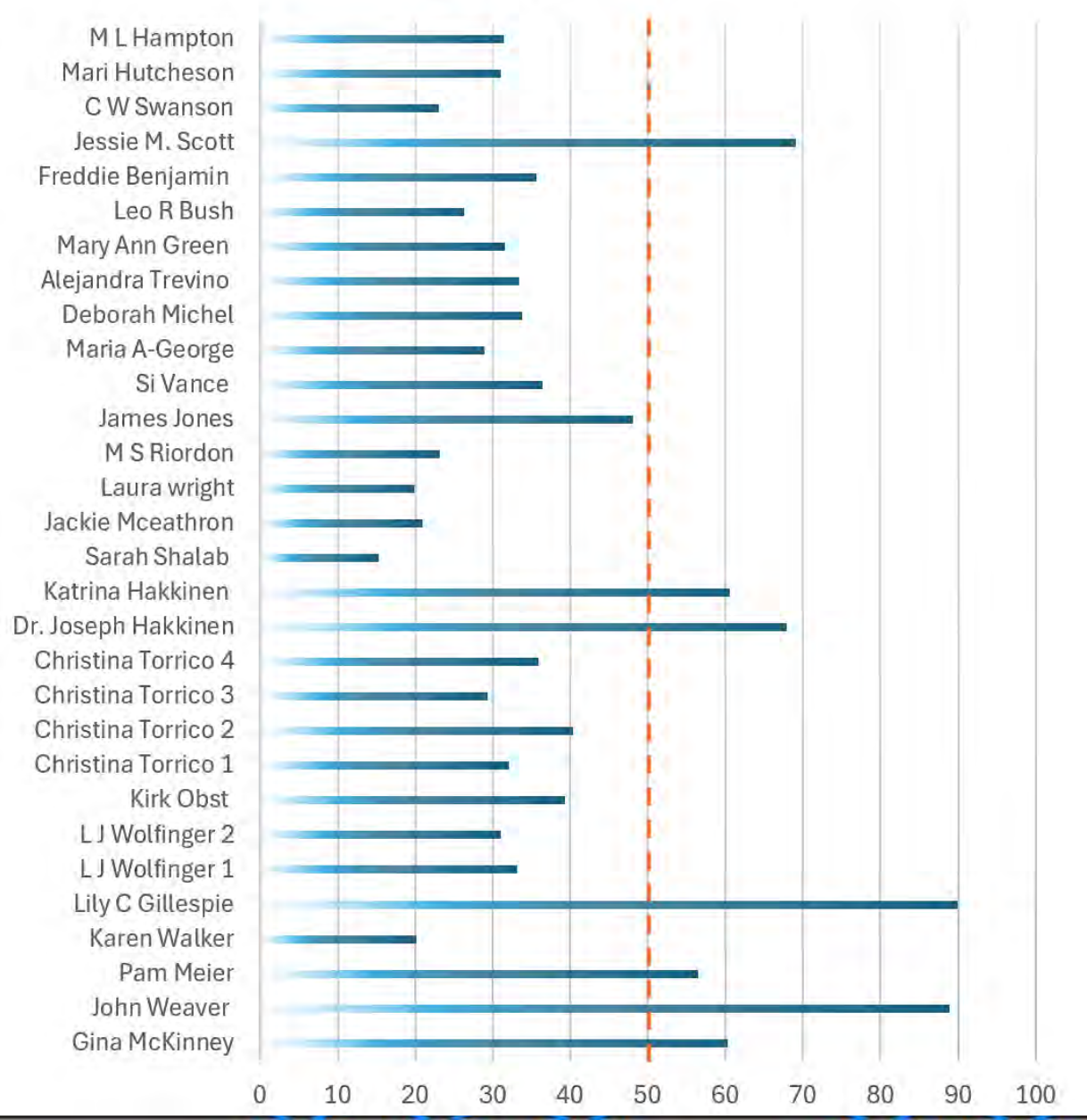



ANTIOXIDANT ACTIVITY OF TX HONEYS (DPPH)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
0
20
40
60
80
100
120
Nu of samples with high antioxidant activity
(>40% RSA)
51 of 104 (49%)

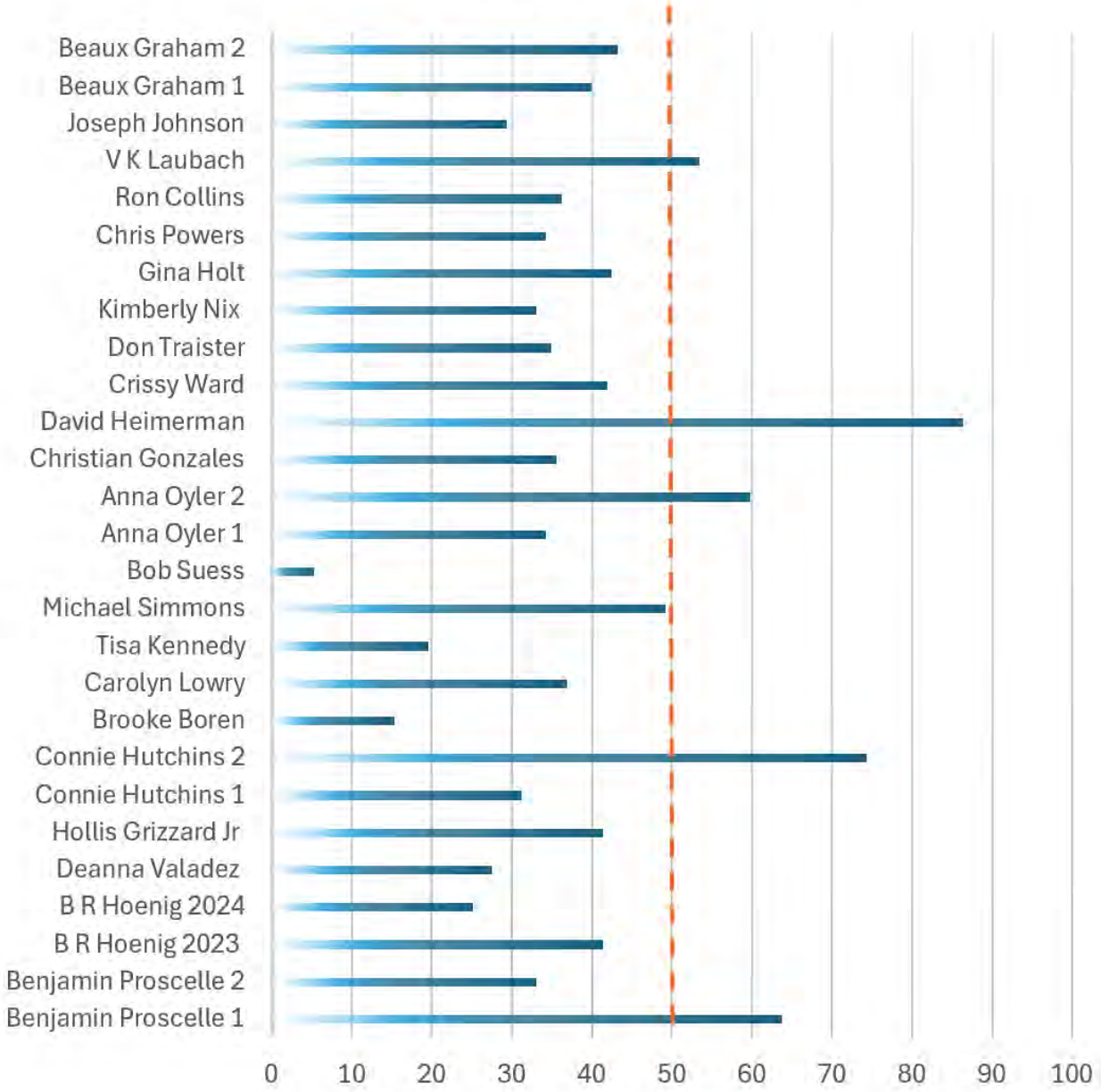
ANTIOXIDANT ACTIVITY (DPPH)
24H1-30



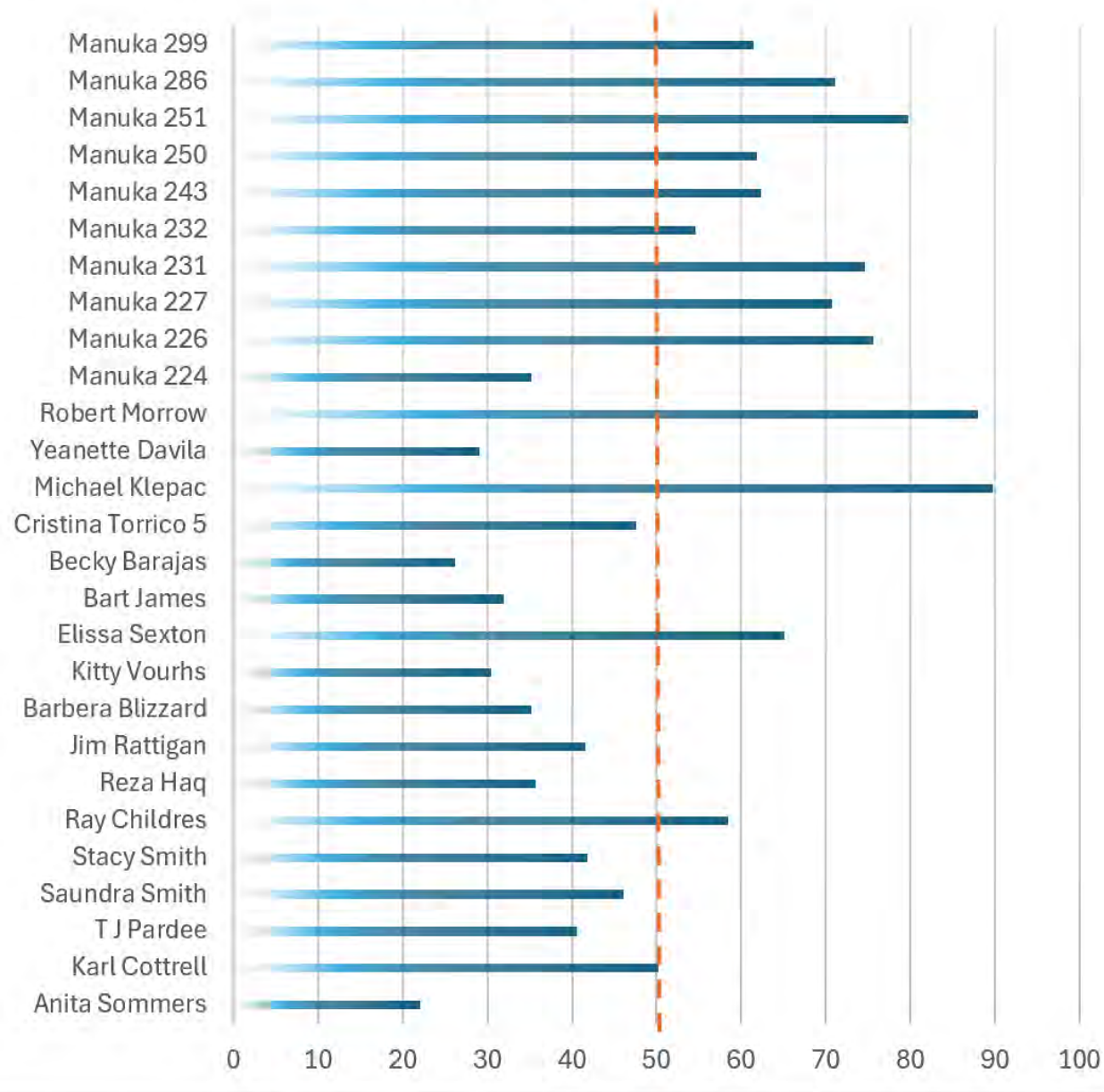
ANTIOXIDANT ACTIVITY (DPPH)
24H31-60



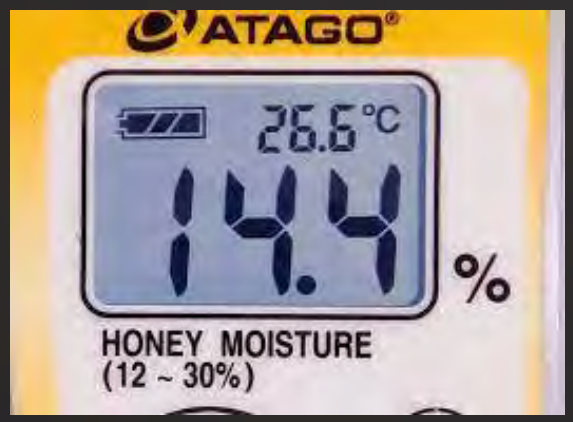
ANTIOXIDANT ACTIVITY (DPPH)
24H61-90

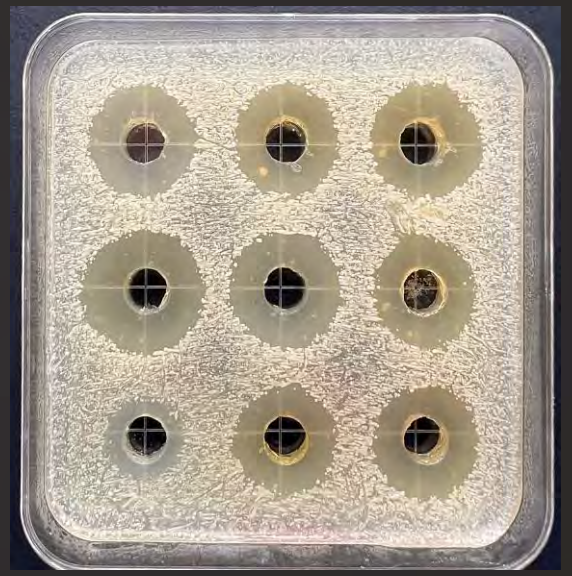


ANTIOXIDANT ACTIVITY (DPPH)
24H92 & MANUKA

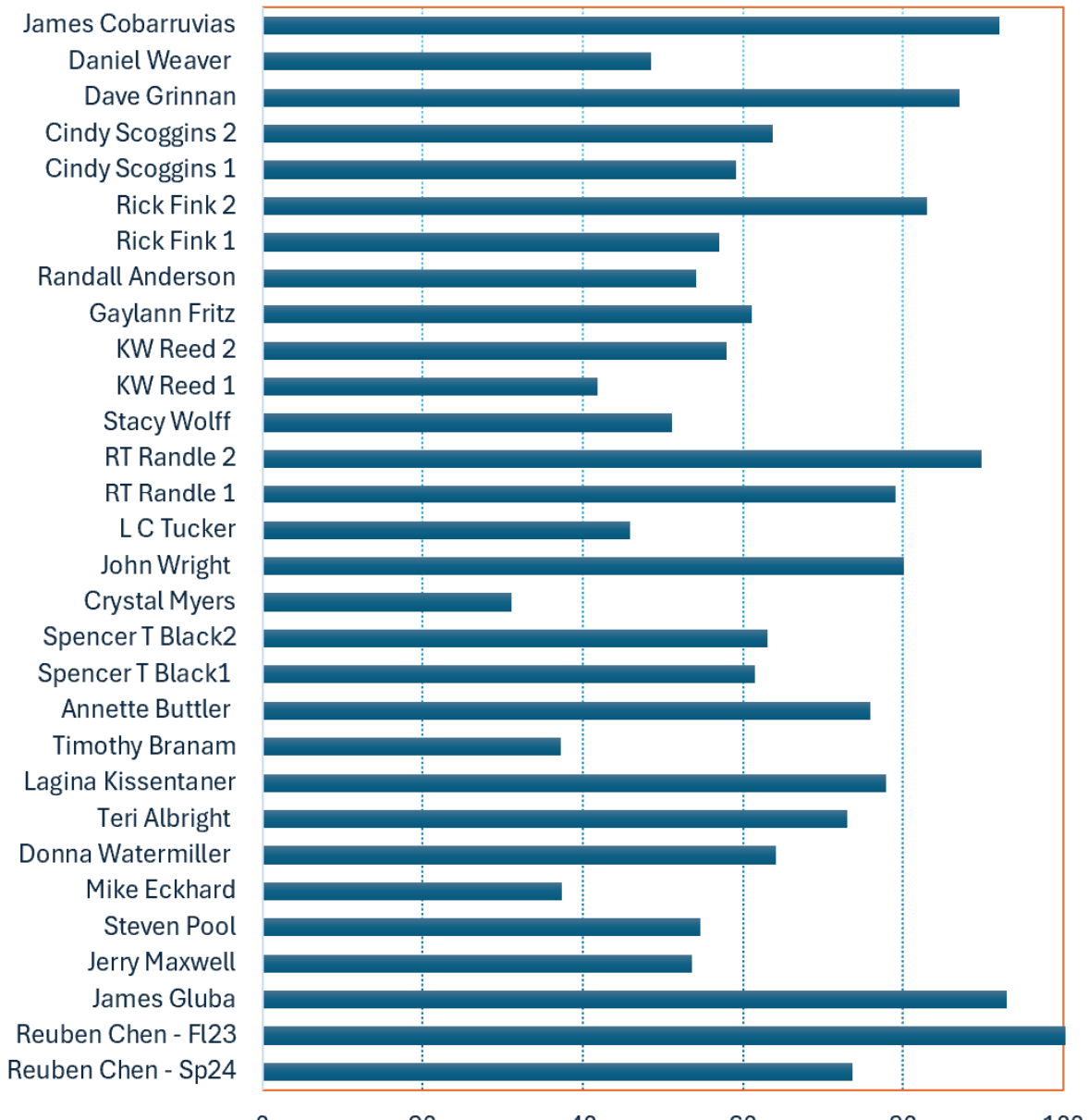


Biological Activity Levels (BAL) of TX Honeys

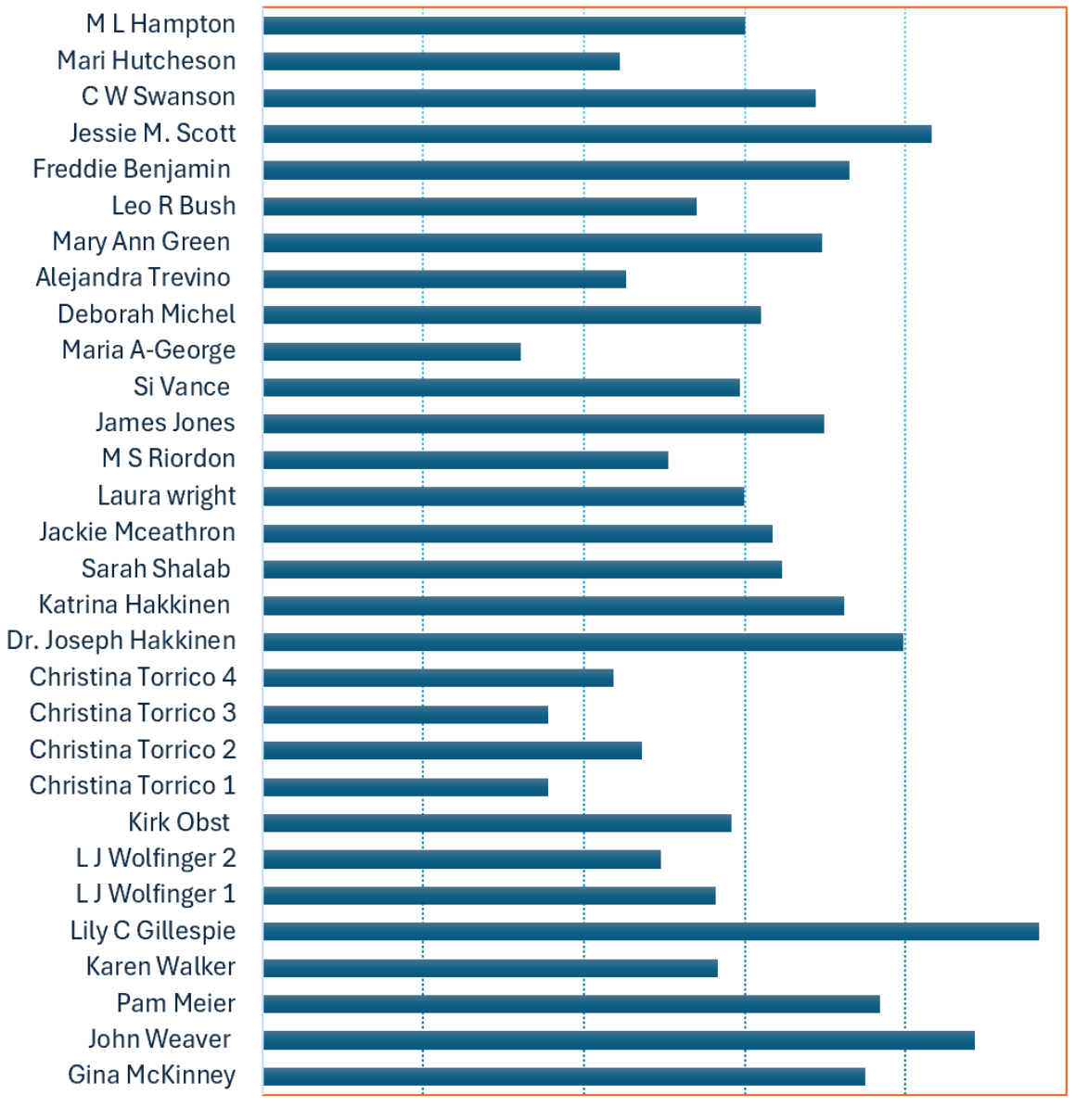




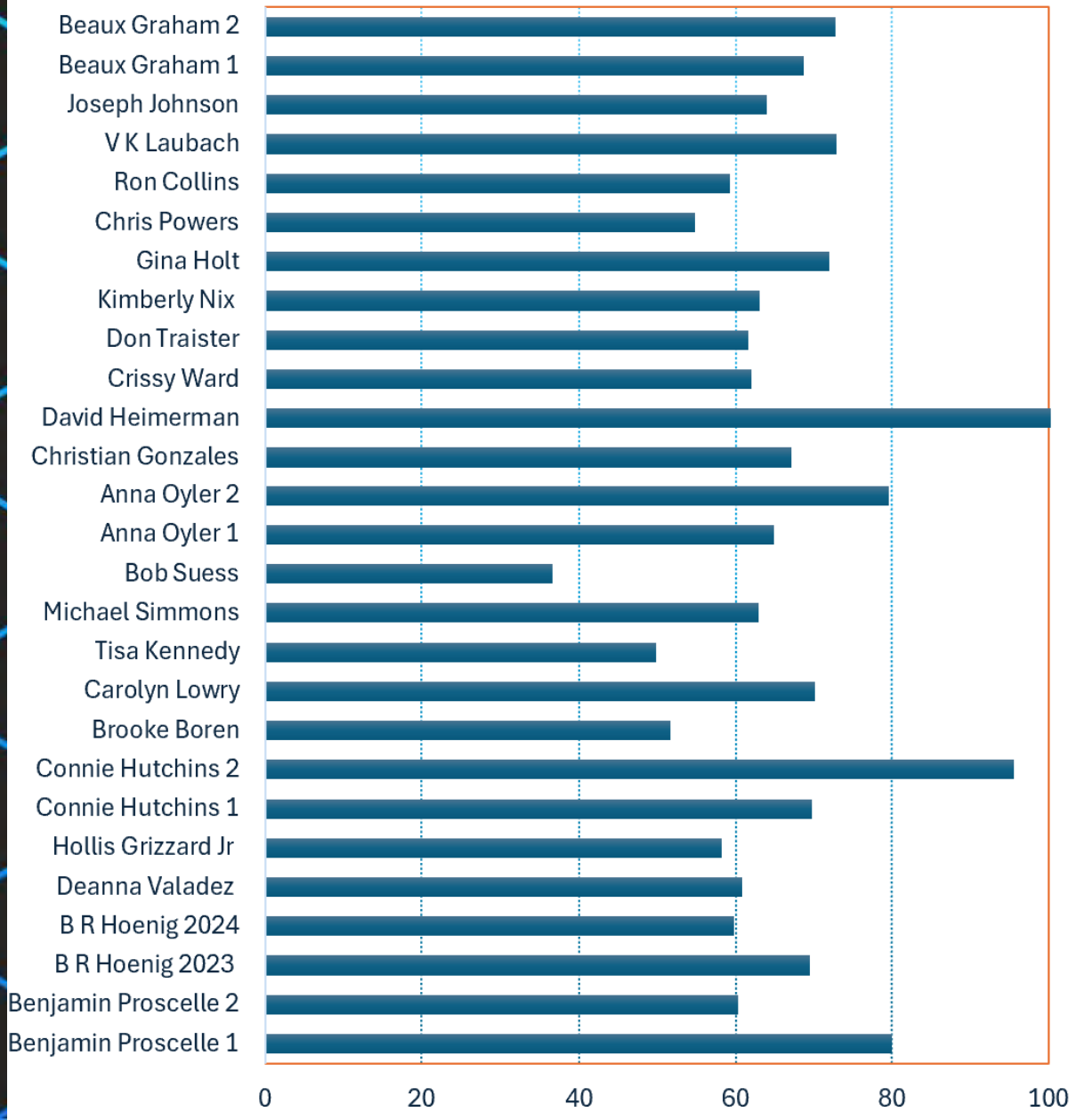
BAL of TX Honeys
24H1-30



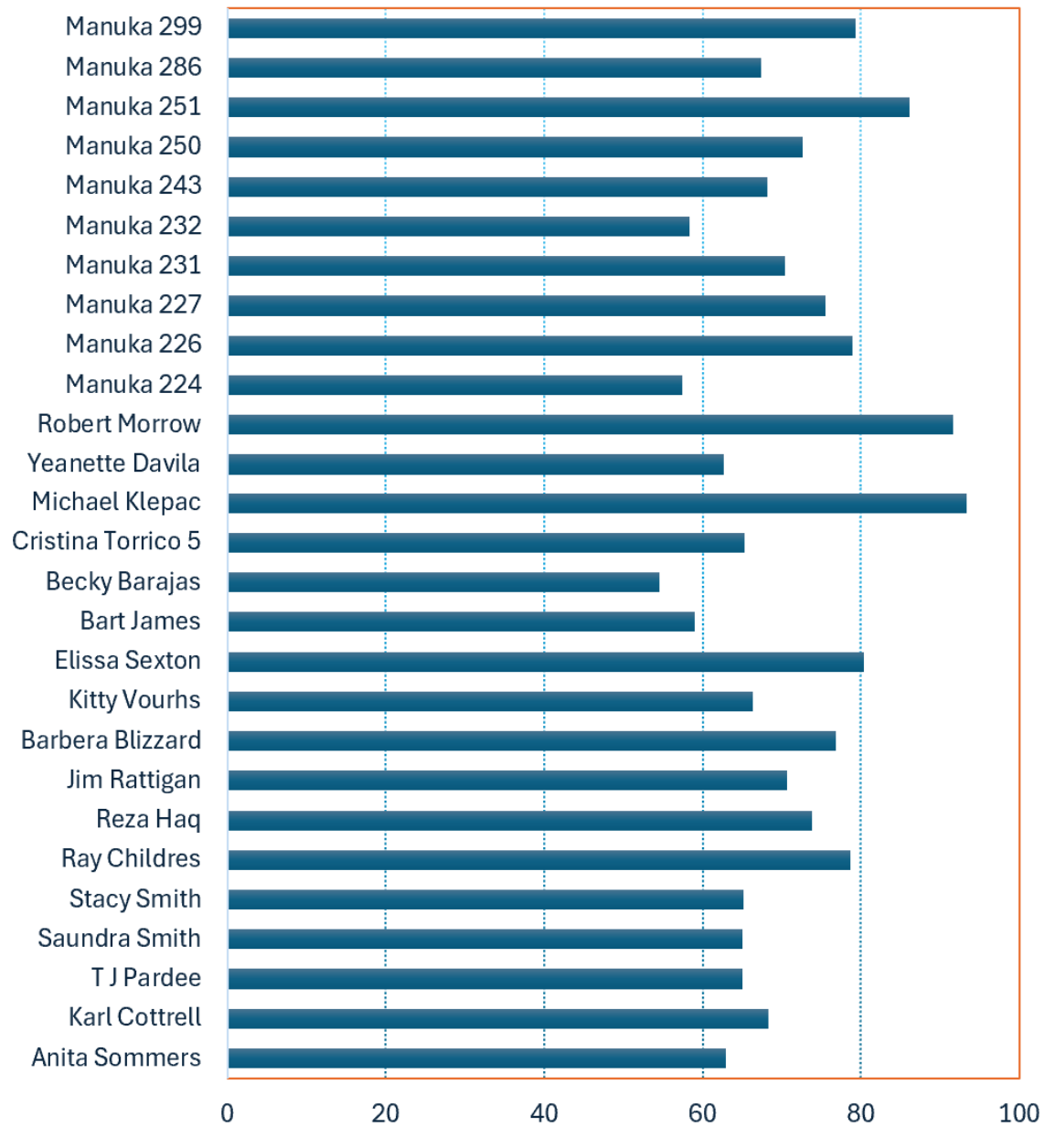
BAL of TX Honeys
24H31-60



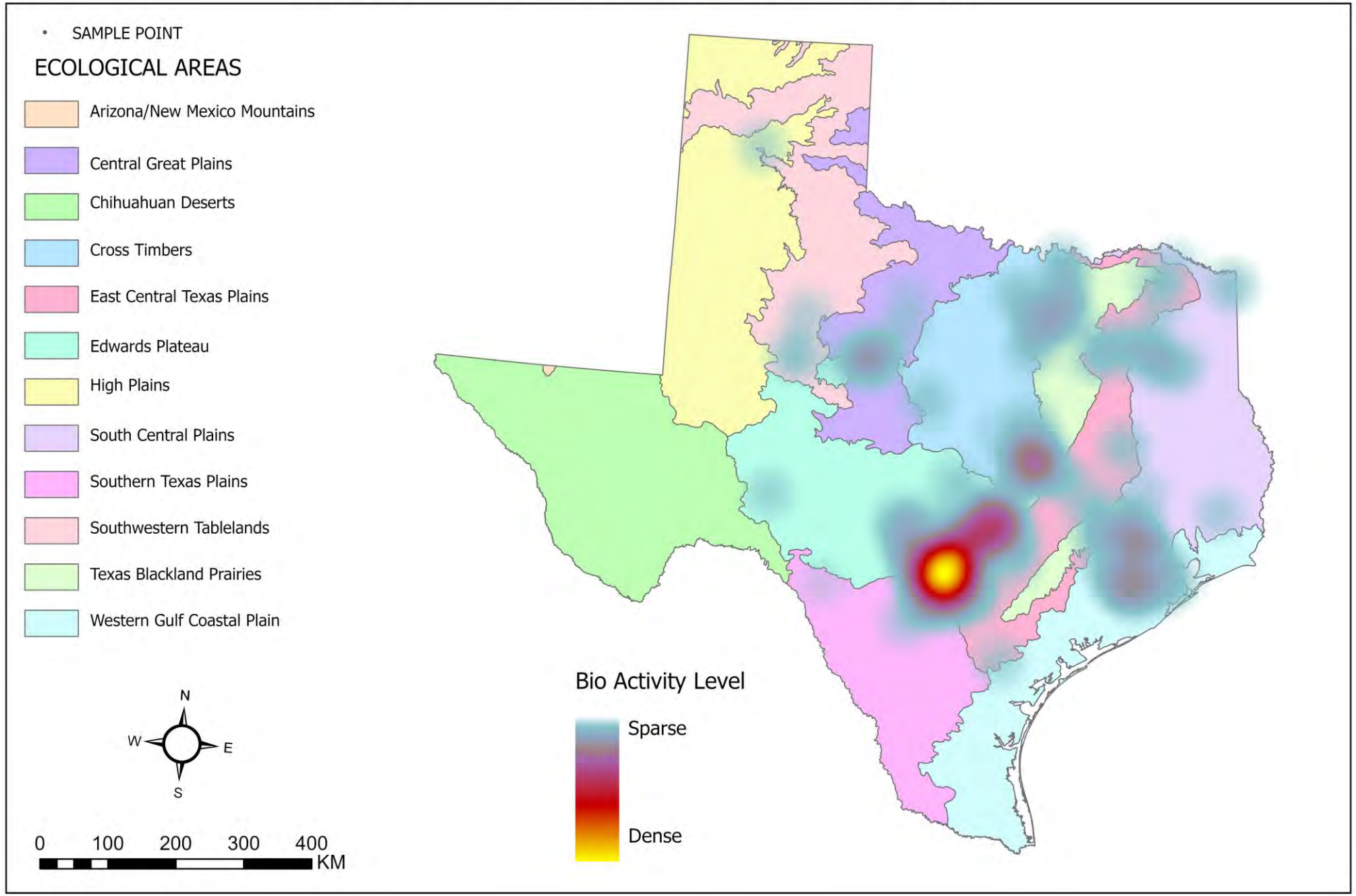
BAL of TX Honeys
24H61-90



BAL of TX Honeys
24H91 & Manuka



ECOLOGICAL AREAS OF TEXAS



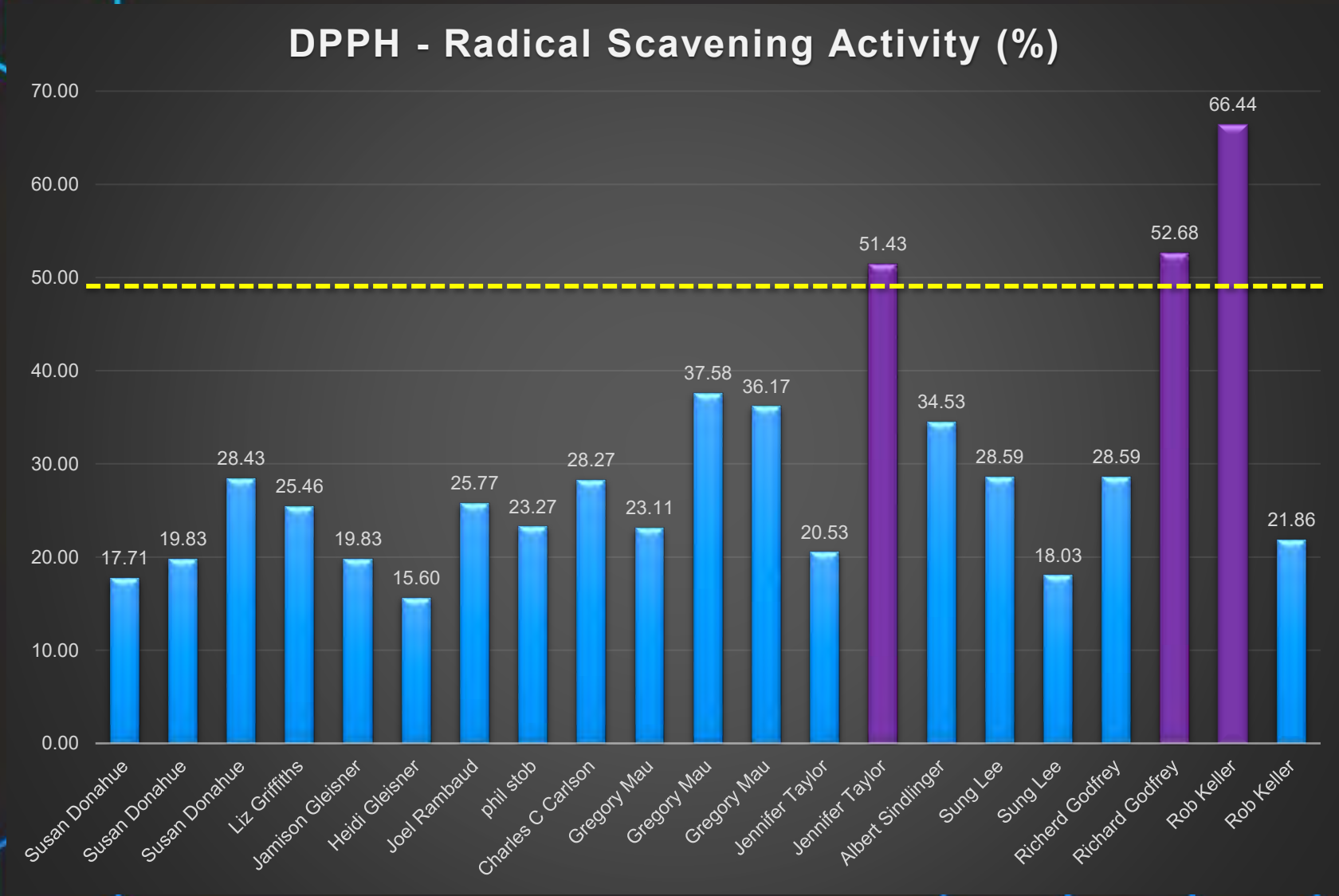
Conclusions for Texas Honeys

TX honeys

- High antimicrobial potential (83%)
- Moderate antioxidant potential (45%)
- Some honeys outperform Manuka honeys for BAL
- Candidates as Medical-Grade honey classification

Antimicrobial Activity of CA Honey Samples- 2025

Antioxidant Activity of CA Honey Samples- 2025



Conclusions for California Honeys

Northern California Honeys

- Color: Light and Extra Light Amber
- pH: Low (3.7) – Moisture: Normal (17.1%)
- Antimicrobial Activity: High (68%)
- Antioxidant Activity: Low (4%)
- Medical-Grade Honey Classification: Antimicrobial Activity (similar to Manuka)

Which honeys have more medicinal potential (in general)?

- Local
- Dark
- Comb

Honey

HONEY PATHWAY

USDA nextgen

UT San Antonio

SR SUL ROSS STATE UNIVERSITY INTERNATIONAL

WHERE HONEY MEETS MEDICINE

Engagement and Education

Seminars, Trainings, Interviews, Talks about Medicinal Honey, Honeybees, Pollination, Beekeeping, Entrepreneurship

K-14 Teacher Training

Train-the-Trainer
Integrate Honey, Honeybees, Pollination into curriculum

Internships

Local, Regional, National, & International Opportunities

CURE - Medicinal Properties of Honey

Course-based Undergraduate Research Experience

Beekeeping Apprenticeship

80-hour Master Beekeeper Training with Bee Mindful

SURE

Undergraduate Research Experience at UT San Antonio

HONEY Pathway

Join HONEY Pathway Programs

Welcome to the University of Texas at San Antonio's HONEY Pathway

Our program focuses on understanding the medicinal properties of honey and its potential applications in healthcare.

Our team of students and researchers are dedicated to conducting in-depth studies to uncover new uses of honey in medicine and to develop new treatments that can improve patient outcomes. We are committed to advancing the field of medicine and making a positive impact on human health.

HONEY PATHWAY
UTSA
The University of Texas at San Antonio
College of Sciences

HONEY Pathway

- About Us
- Our Team
- Our Students
- Our Partners
- Research +
- Join Our Programs −
  - Overview
  - Beekeeping Apprenticeship Boot Camp
  - Summer Undergraduate Research Experience
  - Internships
  - K-14 Teacher Training Program
- News & Media
- Seminars

Stay in the Loop

The Honeycomb Connection at UT San Antonio

- Opportunities in research, beekeeping, and community outreach

@THEHONEYCOMBCONNECTION

Acknowledgements

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UTSA The University of Texas at San Antonio College of Sciences

1880 TEXAS BEEKEEPERS ASSOCIATION

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BEE MINDFUL HAPPY BEES NATURALLY

All honey sample donors and beekeeper associations

Honey CURE Spring 25

Acknowledgements

Thank You

Questions?

Ferhat Ozturk, Ph.D.

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HoneyPathway@UTSA.edu