



Healing for Humankind

HONEY



The University of Texas at San Antonio
College of Sciences



Ferhat Ozturk, Ph.D.

University of Texas

San Antonio

HoneyPathway@UTSA.edu



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.

There are some graphic images about wound healing, which may disturb some viewers.

Honeybees and Pollination



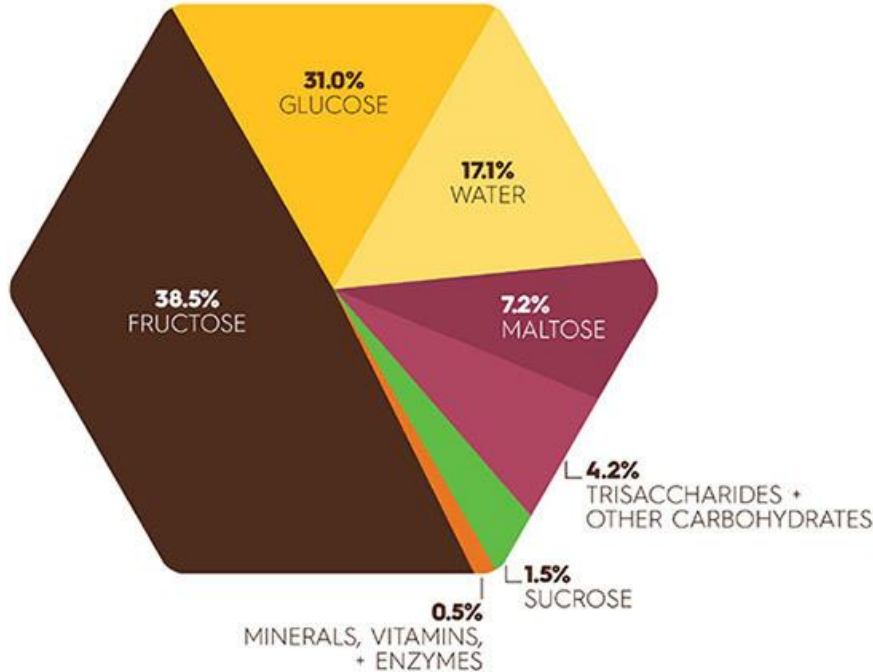
- The life of many plant species depends on bee pollination.
- The reduction of bee colonies poses a serious risk to many plant species survival, and can also be considered a biomarker for human health
- About 75% of food crops is pollinated by insects, mostly by honeybees

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

HONEY

A Natural **Therapeutic** Agent

HONEY'S NUTRITIONAL PROFILE



Honey can contain over 200 compounds, being broadly comprised of

- amino acids,
- vitamins,
- minerals,
- enzymes,
- flavonoids,
- phenolic acids, and
- antioxidants.



Flavonoids

Tannins

Enzymes

Vitamins

Minerals

Fructose

Sucrose

Sugars

Therulose

Glucose

Maltose

Turanose

Erlose

Nigerose

Invertase

Diastase

Glucose
Oxidase

Catalase

Enzymes

Aluminum

Phosphorus

Zinc

Iron

Potassium

Elements

Magnesium

Aspartic
Acid

Manganese

Proline

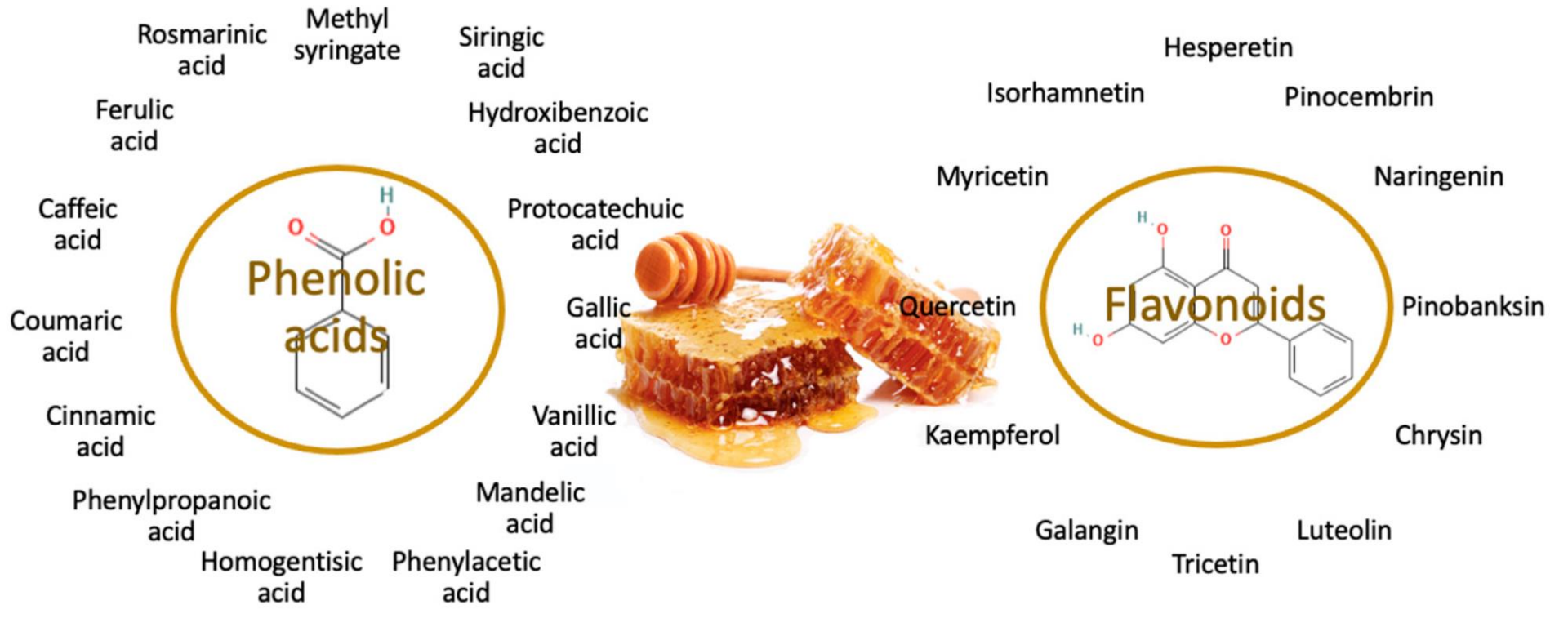
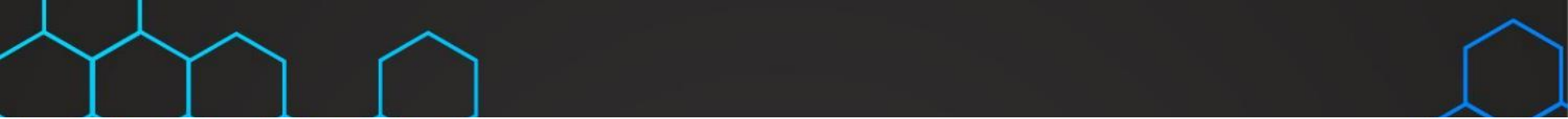
Lysine

Proteins




HONEY Contents





A Comprehensive Review of the Effect of Honey on Human Health
by Marta Palma-Morales ^{1,2} , Jesús R. Huertas ^{1,3}  and Celia Rodríguez-Pérez ^{1,2,4,*} 



A silver spoon is shown from a high angle, tilted to the right. A single, large drop of golden honey is falling from the tip of the spoon, forming a teardrop shape. The background is a plain, light-colored surface.

A single bee will produce only about $1/12^{\text{th}}$ of a teaspoon of honey in its lifetime.

This converts into around 2 million flowers and bees flying about 50,000 miles to make 1 pound of honey.

How the Honeybees Make Honey?



TYPES OF HONEY

BLOSSOM HONEY



HONEYDEW HONEY



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

Types of Honey

1. Acacia honey
2. Acacia mangium honey
3. Alfalfa honey
4. Almond honey
5. **Andromeda honey**
6. Anzer honey
7. Australian box honey
8. Australian Eucalyptus Honey
9. Avocado honey
10. **Bashkir honey**
11. Basswood/Linden honey
12. **Beechwood honey**
13. **Berringa honey**
14. Blackberry honey
15. Black Mangrove honey
16. Blueberry honey
17. Borage honey
18. Buckwheat honey
19. Cannabis honey
20. Carob honey
21. **Cedar honey**
22. **Centauri honey**
23. **Chestnut honey**
24. Citrus honey
25. Clover honey
26. Coffee honey
27. Coriander honey
28. Cotton honey
29. Dandelion honey
30. Durian honey
31. **Elvish honey**
32. Eucalyptus honey
33. Euphorbia honey
34. Fennel honey
35. **Fir honey**
36. Fireweed honey
37. Frankincense honey
38. Gallberry honey
39. **Gelam – Melaleuca honey**
40. Heather honey
41. Himalayan red honey
42. Honeydew honey
43. Horehound honey
44. Ikaria Honey
45. Jara honey
46. **Jarrah honey**
47. Kanuka honey
48. Kelulut honey
49. Lavender honey
50. Leatherwood honey
51. LifeMel honey
52. Loquat honey
53. Longan honey
54. **Mad honey**
55. **Maharishi honey**
56. **Manuka Honey**
57. **MeliBio**
58. **Metcalfa honey**
59. Mint Honey
60. Moringa honey
61. **Mountain Laurel honey**
62. **Neem honey**
63. Noni honey
64. **Oak honey**
65. Oregano honey
66. Palmetto honey
67. **Peach honey**
68. Phacelia honey
69. **Pine honey**
70. Pineapple honey
71. **Plum honey**
72. Rapeseed honey
73. Rhododendron honey
74. Rosemary honey
75. Saffron honey
76. Sage honey
77. Sahara honey
78. **Sidr Honey**
79. Spruce honey
80. Sourwood honey
81. Strawberry tree honey
82. Sunflower honey
83. Thyme honey
84. **Tualang honey**
85. Tupelo honey
86. **Tutu honey**
87. **Ulmo honey**
88. Viper's Bugloss honey
89. **White Poplar**
90. Ziziphus honey

Honeydew Honey
Medical-Grade Honey
Expensive Honey
Artificial Honey
Toxic Honey

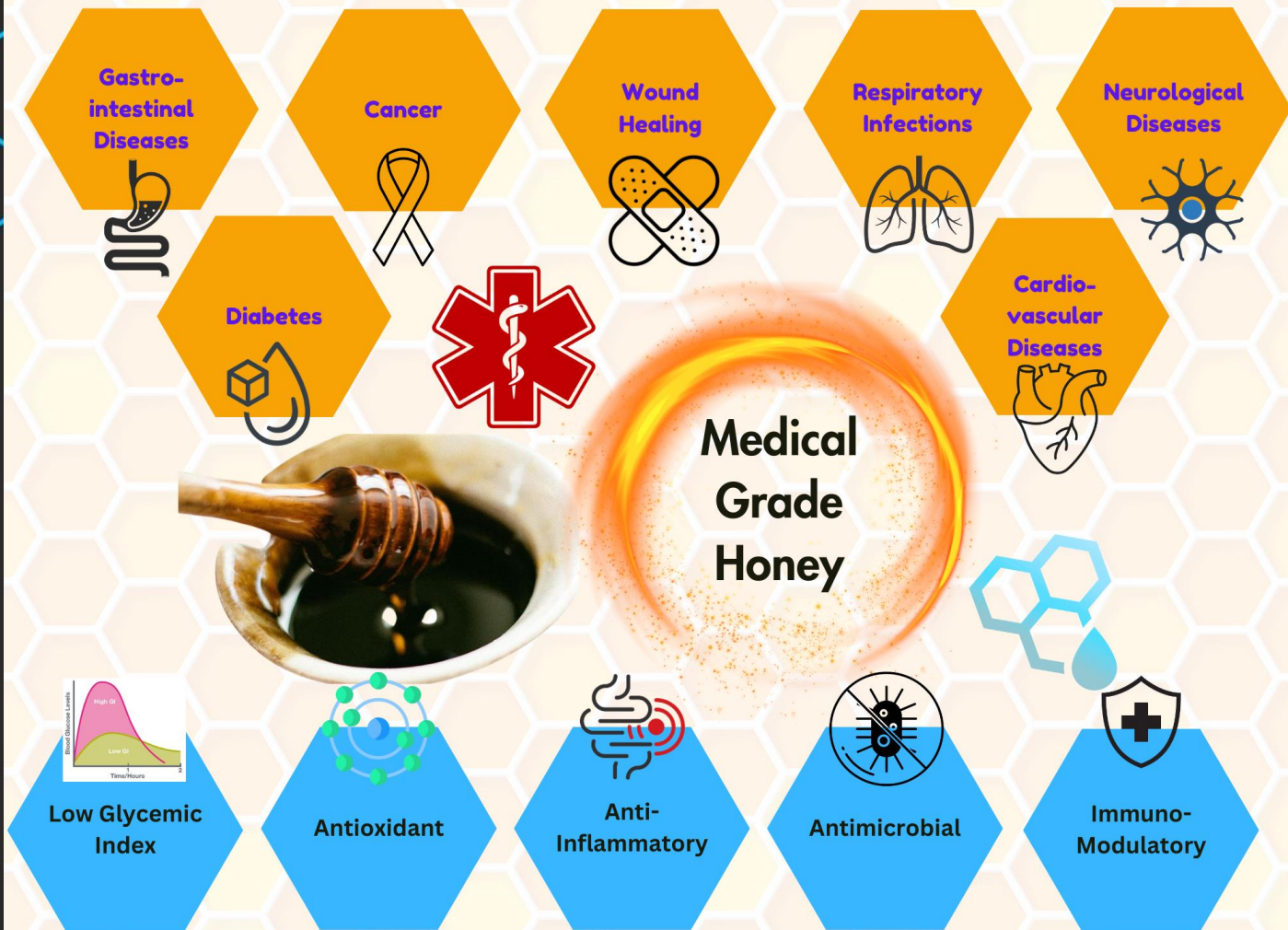
Honey as Medicine



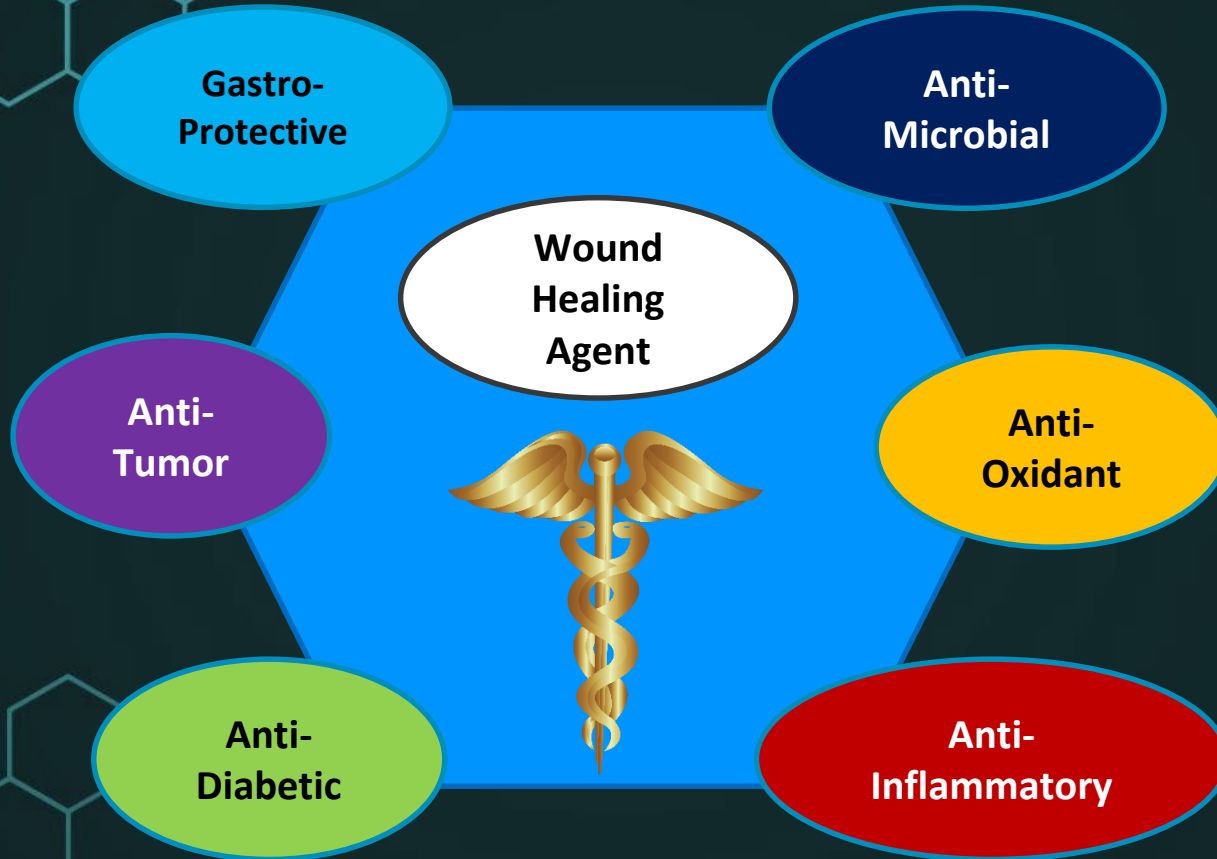
Use of Honeybee Products for Different Diseases

<ul style="list-style-type: none">• Allergy• Alcoholism• Alzheimer's Disease• Arthritis• Autoimmune Conditions• Bacterial Infections• Brain Conditions• Cancer	<ul style="list-style-type: none">• Cardiovascular Diseases• Constipation• Cough and Colds• Diabetes• Digestive Conditions• ENT: Ear, Nose, Throat conditions• Eye Conditions• Fertility and Sexual Dysfunctions	<ul style="list-style-type: none">• Herpes• Immunity• Liver conditions• Obesity• Oral conditions• Multiple Sclerosis• Parkinson's Disease• Respiratory Conditions	<ul style="list-style-type: none">• Sinusitis• Sleep Disorders• Skin Conditions• Sport Performance• Thyroid Conditions• Veterinary Use• Viral Diseases (HIV, COVID19)• Wound Care
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Honey is Medicine



Medicinal Properties of Honey

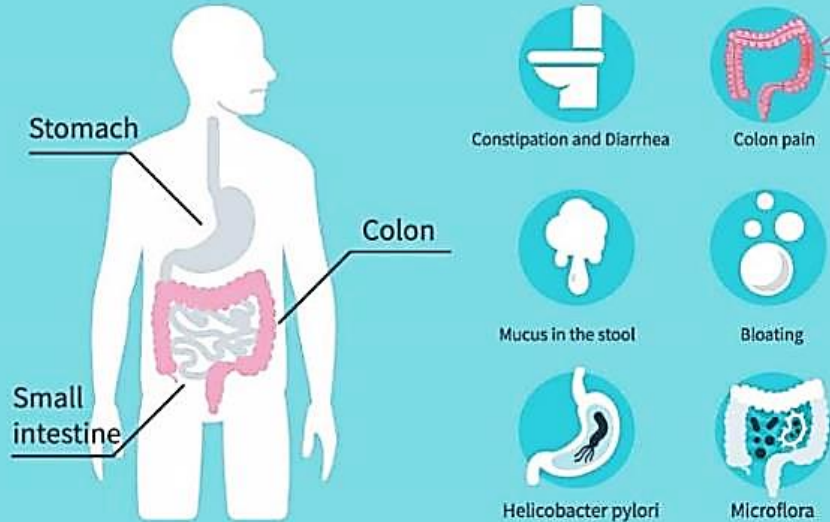




Practical Applications of Honey for Therapeutic Purposes

Honey for Gastrointestinal Diseases

IBS SIGNS AND SYMPTOMS Irritable Bowel Syndrome

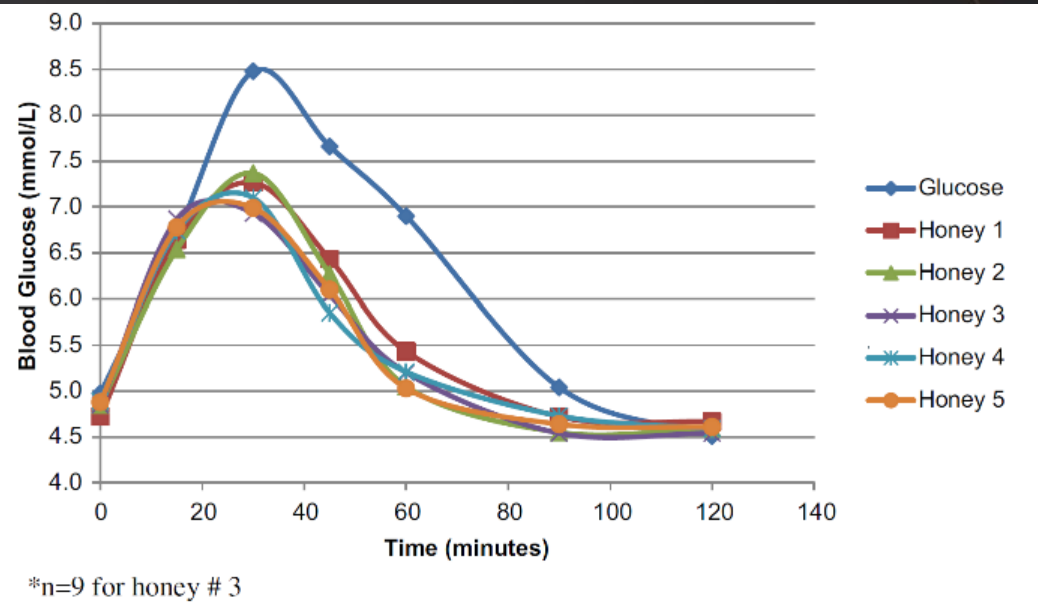


Warm honey drink for constipation

Cold honey drink for diarrhea

Honey into empty stomach for ulcer

Honey and Diabetes



The glycaemic index of Manuka honey

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

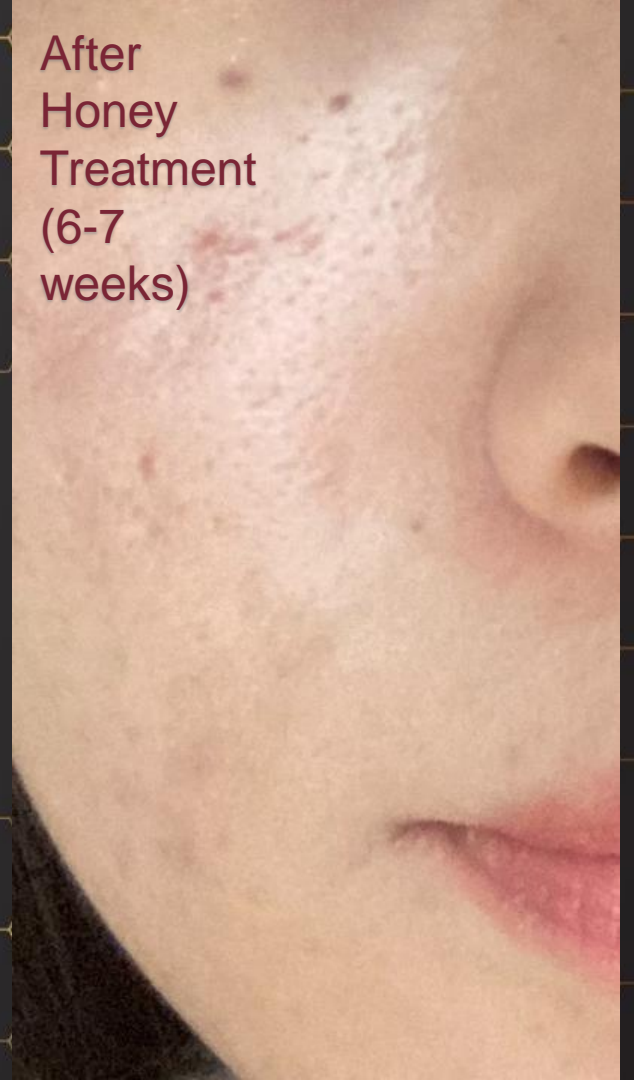
DOI: [10.1016/j.clinme.2012.11.002](https://doi.org/10.1016/j.clinme.2012.11.002)

Lynne Chepulis · Evelyn Francis

Before
Honey
Treatment

Honey for
Acne
Treatment
-
UTSA
Student

After
Honey
Treatment
(6-7
weeks)



Honey for Sore Throat

Sore Throat *Pharyngitis*

Possible signs
of a sore throat

White patches

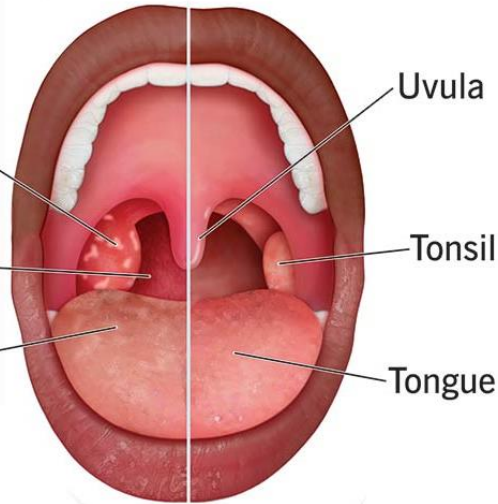
Redness
and swelling

Pale tongue

Uvula

Tonsil

Tongue



Cleveland Clinic ©2024





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Honey Bioactivity

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

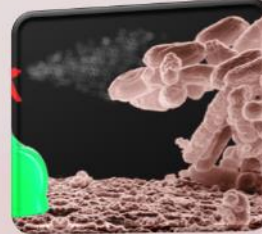


High Sugar
Concentration
(76%)

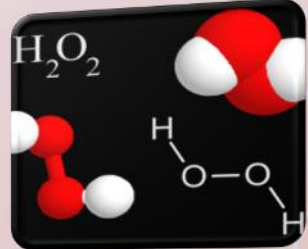


DANGER
Acid

Acidity
(pH 3.6)

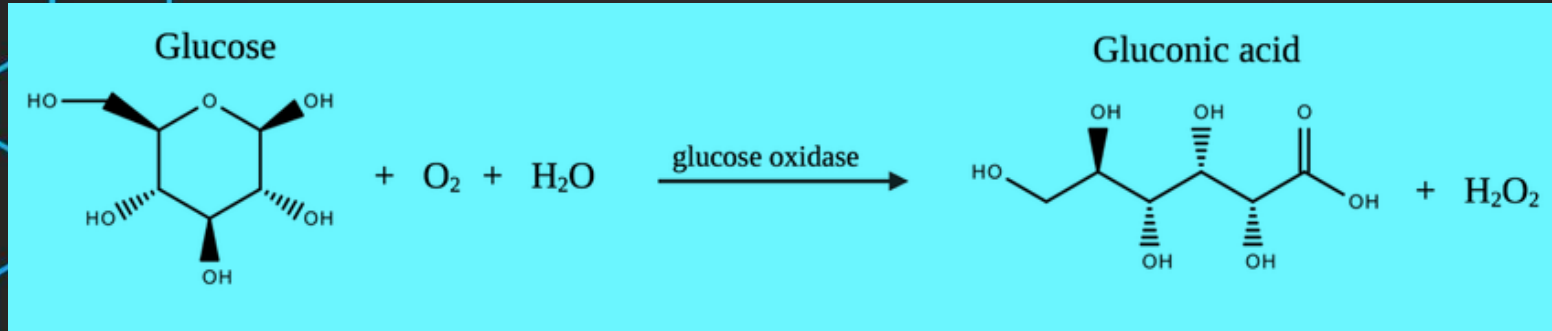


Organic
Antibacterial
Compounds

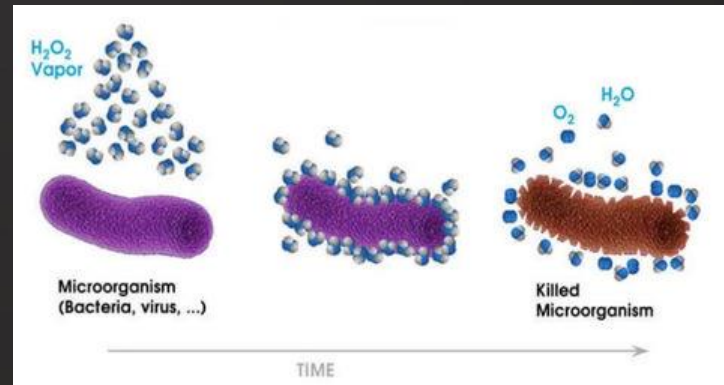


Hydrogen
Peroxide
(H_2O_2)

Honey's Peroxide Activity

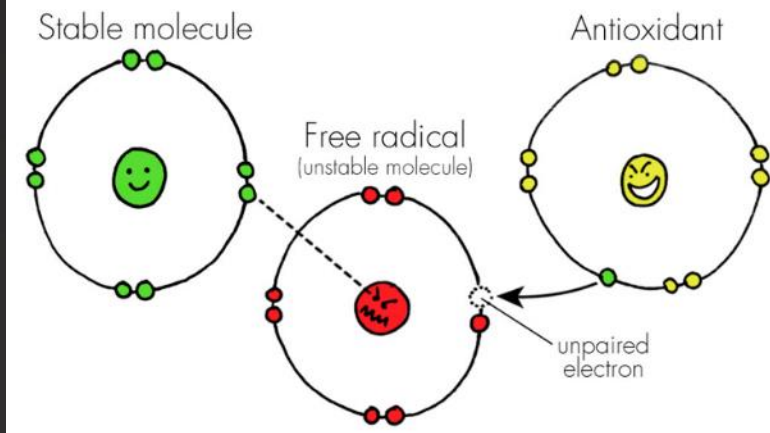
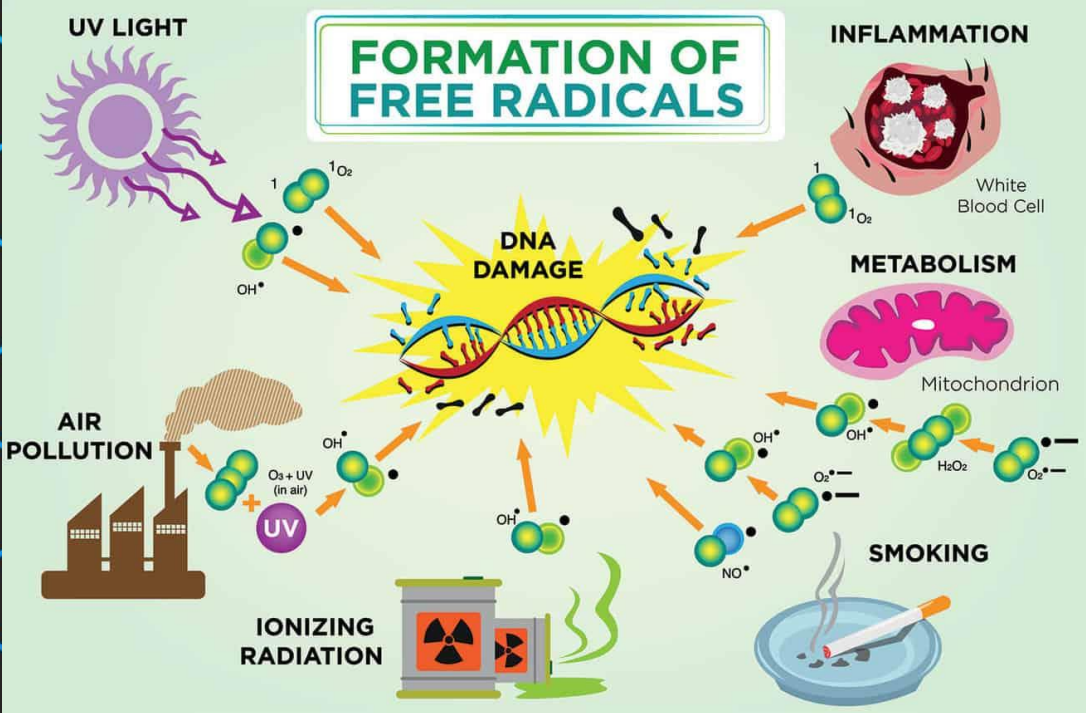


Oxidative Stress

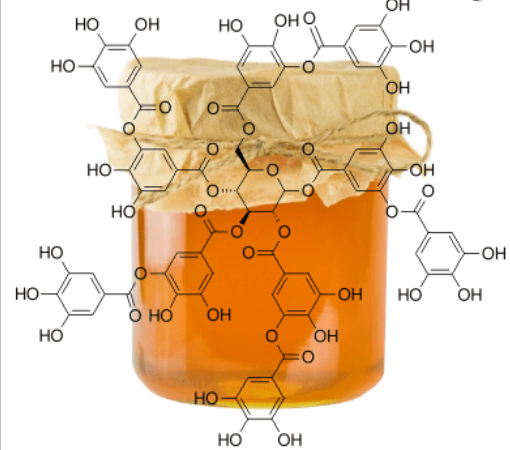


Honey as an Antioxidant Agent

FORMATION OF FREE RADICALS



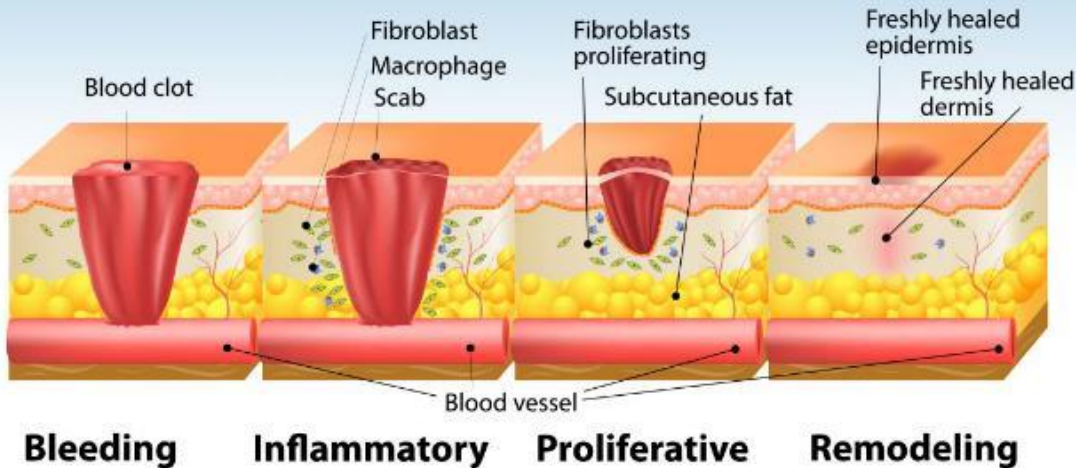
Natural antioxidants in honey



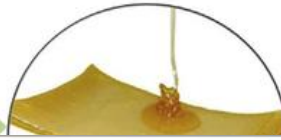
keep us healthy and young!

Honey for Wound Healing

Stages of Wound Healing



Honey and



Inflammatory phase

- Wound bioburden
- Oxidative cellular damage
- Biofilm formation
- Bacterial cell cycle
- Progression
- Wound pH

- ↑ Peroxide generation
- ↑ Proinflammatory cytokines
- ↑ Antioxidant activity

Proliferative phase

- ↑ Epithelialization
- ↑ Granulation tissue
- ↓ Wound edema and exudate

- MMP-9
- TGF- β
- Hygroscopic effect

Modeling phase

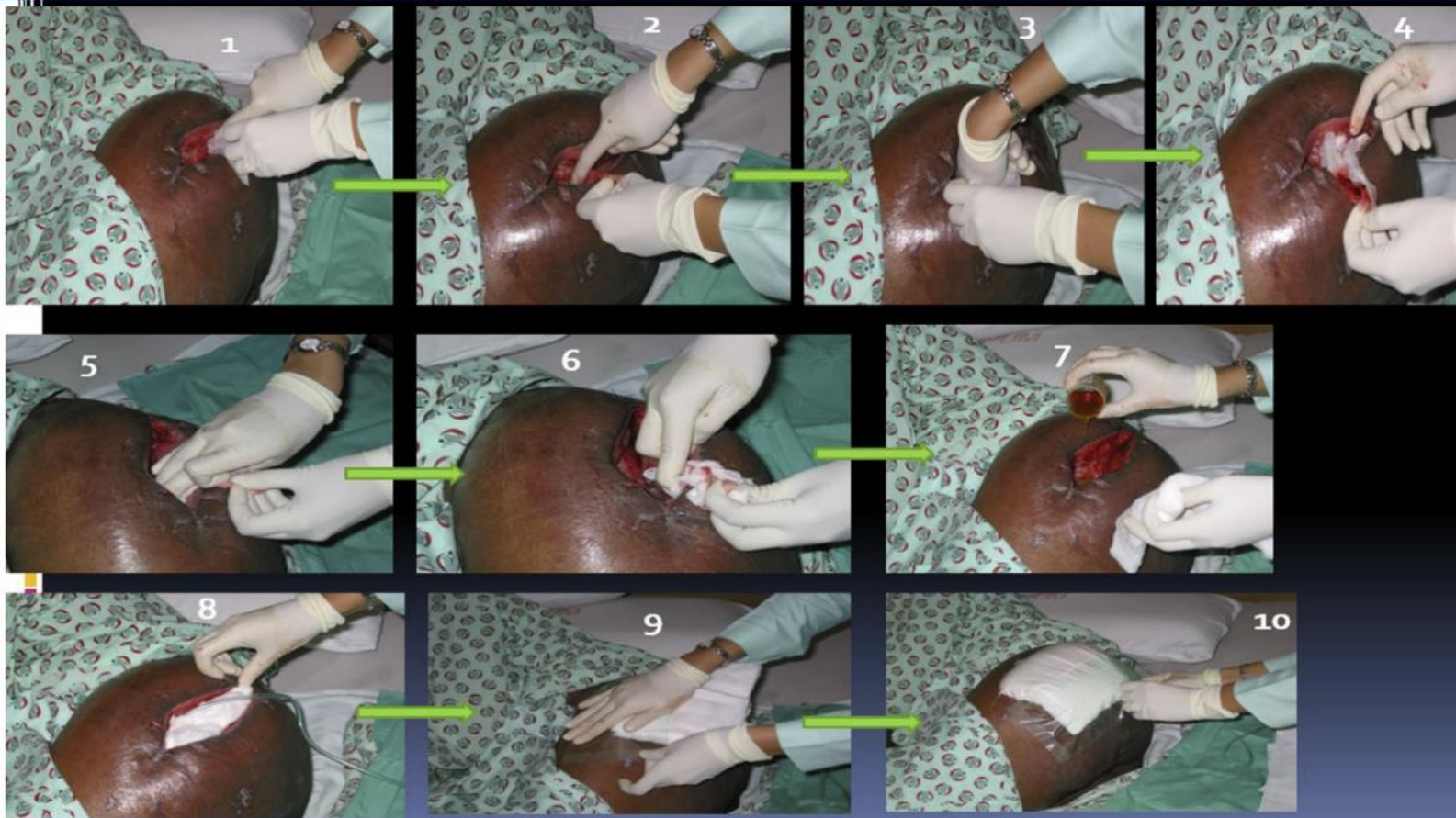
- ↑ Wound remodeling
- ↓ Scar formation and contractures

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

WARNING

GRAPHIC CONTENT

Honey Application for Wound



Clinical Trial (Univ of Malaysia)



Hemiparalytic Bed Sore



**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**

Honey Application for Burn Wounds



**3-yo male infant
Scald burn**



L-Mesitran Ointment

E. Smaropoulos, MD PhD

Personal Anecdote (Austin, TX)



**9-yo Female
Neuropathic Ulcer**

**Medical-Grade
SLF Honey
F. Ozturk, Ph.D.**

Diabetic Neuropathic Ulcer



Figure 1. (A-E) Case 1. Diabetic neuropathic ulcer with 3 weeks time to healing.

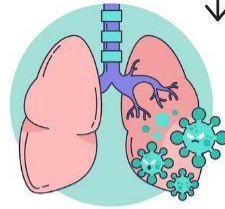
Honey as a topical treatment for wounds (Review)

Jull AB, Cullum N, Dumville JC, Westby MJ, Deshpande S, Walker N



THE COCHRANE
COLLABORATION®

↓ Gastroenteritis duration



↓ Respiratory infections symptoms

↓ Cardiovascular risk factors

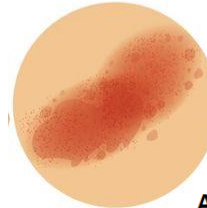


↓ Intoxication time



↓ Blood glucose and insulin levels

↓ Mucositis

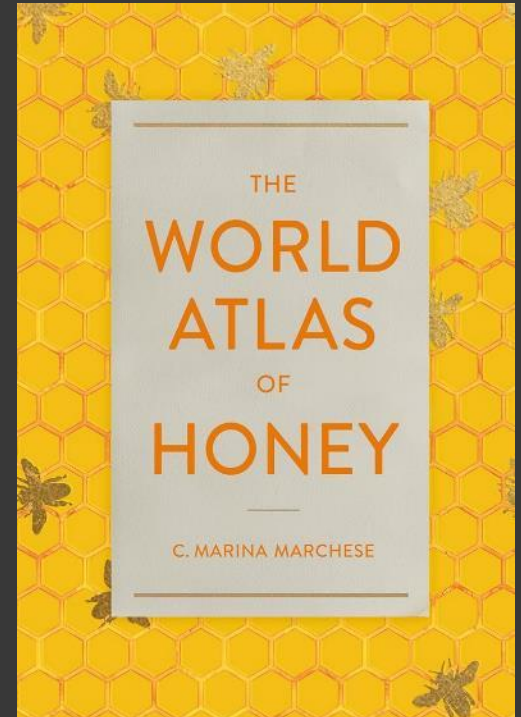
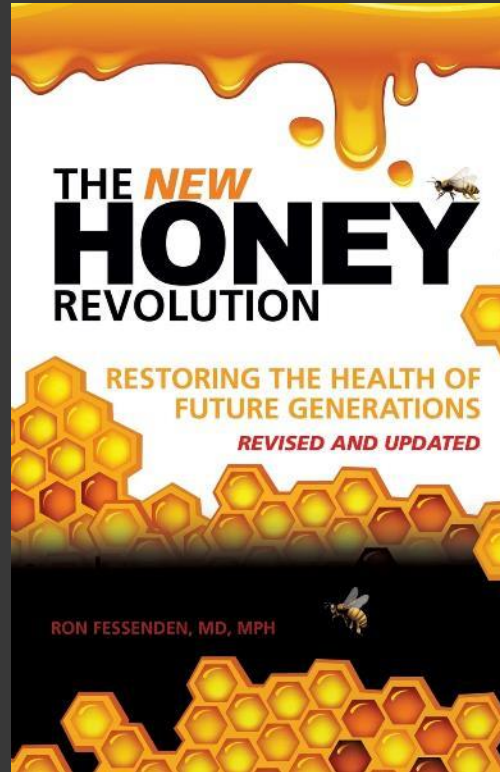
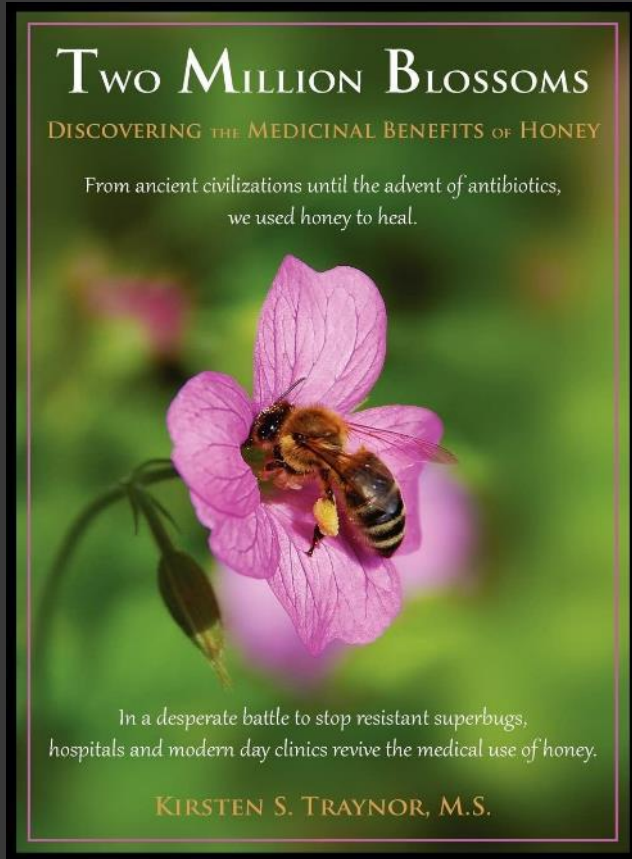


↑ Wound healing

A Comprehensive Review of the Effect of Honey on Human Health

by Marta Palma-Morales ^{1,2} , Jesús R. Huertas ^{1,3}  and Celia Rodríguez-Pérez ^{1,2,4,*} 

Recommended Books





PATHWAY

UTSA The University of Texas at San Antonio
College of Sciences

Identification of Medical-Grade US Honeys

Honey Violations and Adulterations

Production

Systematically harvesting immature honey

Artificial feeding of bees during a nectar flow.

Masking and/or mislabelling the origin of the honey

Diluting honey with sugar syrups

Dehydrating immature honey with technical devices

Processing

Eliminating unwanted aromas, residues, and quality control components, while also lightening honey's color

Adding pollen to honey to disguise the botanical and/or geographical origin

MEDICINAL HONEYS FROM DIFFERENT COUNTRIES



New Zealand

Buckwheat
Honey



Manuka Honey



US and Canada



MEDICINAL HONEYS FROM DIFFERENT COUNTRIES



Chile



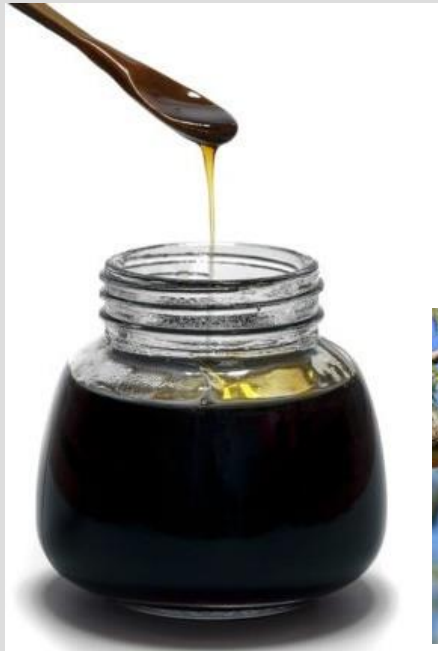
Ulmo Honey

Chestnut
Honey



Turkiye

MEDICINAL HONEYS FROM DIFFERENT COUNTRIES



Malaysia



Tualang Honey

Sidr Honey



Yemen / Saudi Arabia / Pakistan

MEDICINAL HONEYS FROM DIFFERENT COUNTRIES



Balkans / US

Oak Honey

JarraH Honey



Australia



MEDICINAL HONEYS FROM DIFFERENT COUNTRIES



US (Northeast)



Spotted Lantern Fly (SLF) Honey

Mad Honey



Turkiye / Nepal



4



Honey in the Medical Market

Medical-Grade Honey Criteria

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

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

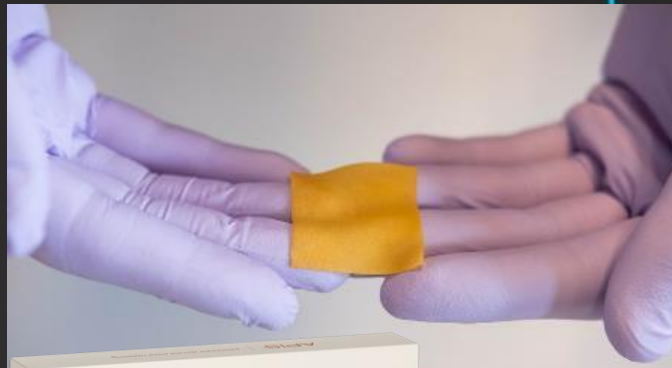




- Hydrogel
- Hydrocolloid
- Alginate
- Paste
- Ointment
- Gel

MGH
Wound
Products





- Collagen-based
- Hydrogel



MGH
Wound
Products



How to Identify

Medicinal Honey?

Antimicrobial
Activity

Physicochemical
Characteristics

Antioxidant
Activity

Medical
Grade
Honey

```
graph TD; A[How to Identify Medicinal Honey?] --> B[Physicochemical Characteristics]; A --> C[Antimicrobial Activity]; A --> D[Antioxidant Activity]; B --> E((Medical Grade Honey)); C --> E; D --> E;
```

Antimicrobial Analysis of Honey

Agar Well
Diffusion Assay

Hydrogen
Peroxide
Activity

XTT
Metabolic Assay

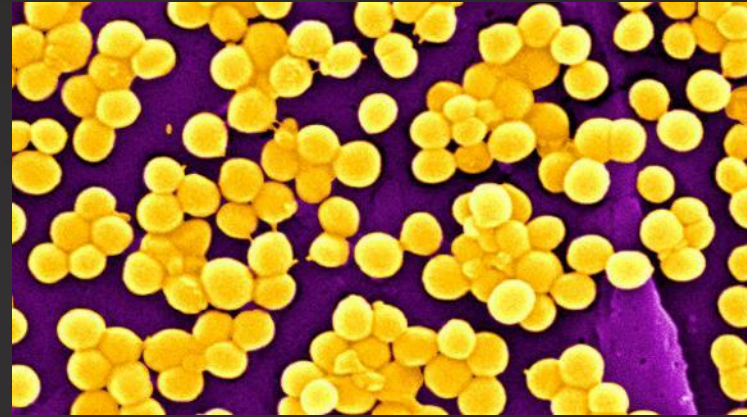
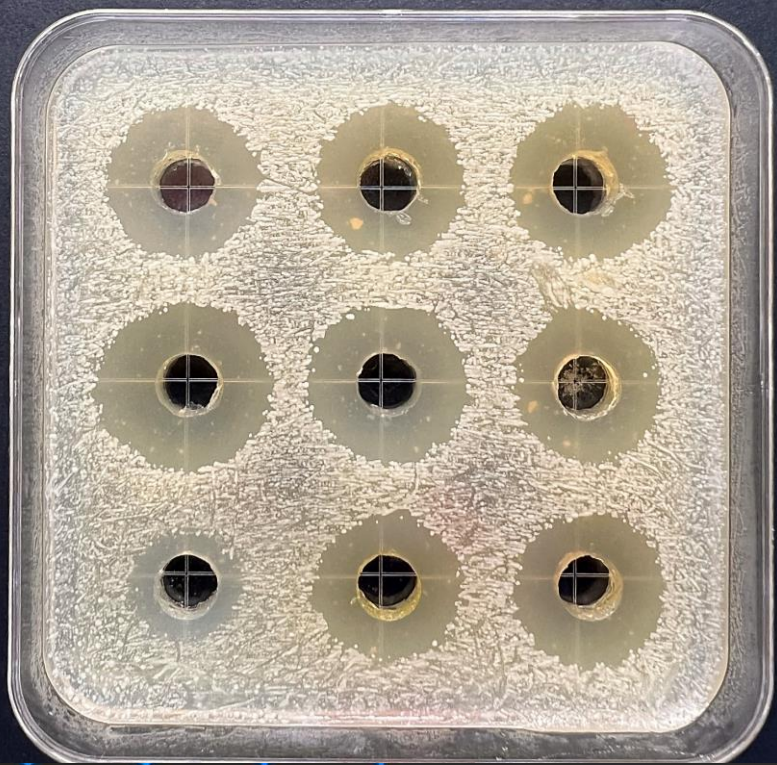
Cell
Proliferation
and Viability

Disk Diffusion
Assay

Prevention of
Biofilm Formation



Well Diffusion Assay of TX Honey



Staphylococcus aureus

Zone of Inhibition (Zoi)

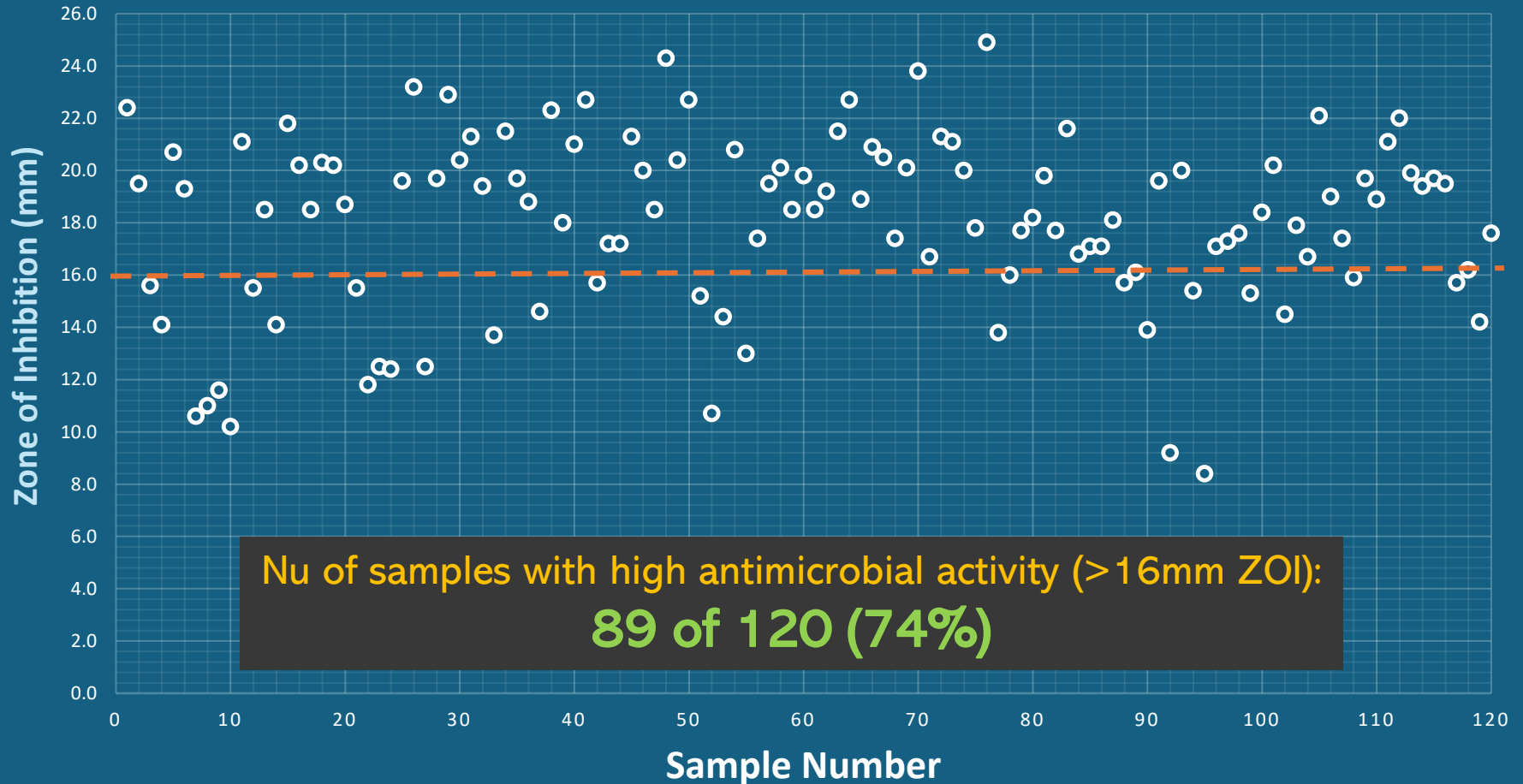
Weak: < 11 mm

Moderate: ≤ 16 mm

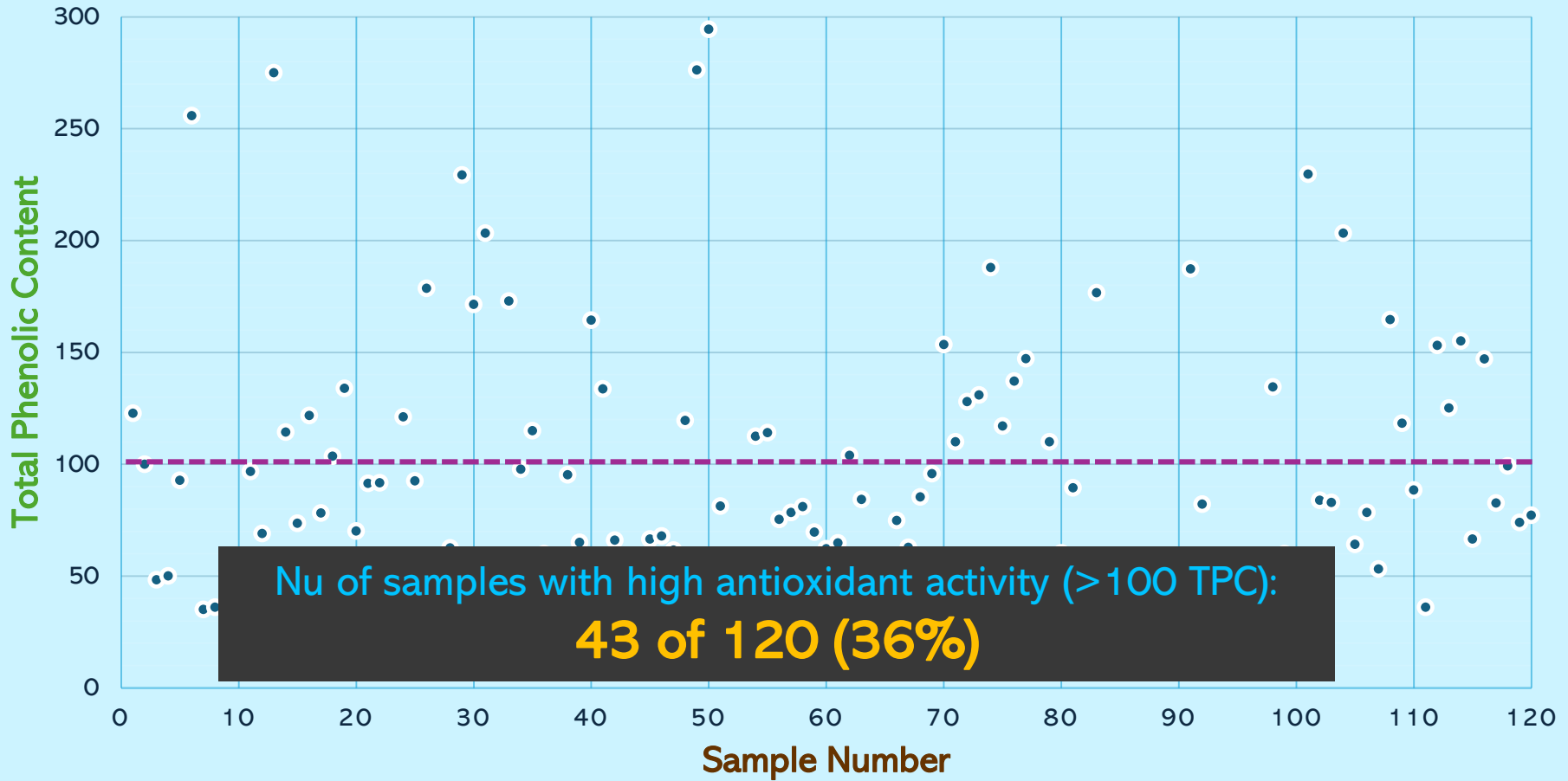
Strong: >16 mm



ANTIMICROBIAL ACTIVITY



ANTIOXIDANT ACTIVITY



Bioactivity of Texas Honeys (2022-24)

Sample ID	Donor	Zip Code	BAL %	Nectar
23H-76	Veronica Hawk	78163	99.8%	Acorn, Oak
SA-42	Randy & Tara Randle	78063	99.7%	Wildflower
23H-74	Laura Wright	78070	98.6%	Wildflower
SA-31	Jeff Jackson	78003	97.7%	Wildflower, horsemint
23H-83	Shawn "WJ" Rockefeller	78623	97.6%	NA
SA-18	Carrie Ortiz	78163	96.7%	NA
TX-33	James Nielson	76234	95.8%	Wildflower
SA-9	Linda Williams	78232	94.3%	Wildflower / Mesquite
SA-32	Disa Campbell	78216	93.4%	Guajillo
TX-31	Vaughan	75169	93.2%	Horsmint, sunflower, wildflower
23H-29	Randy & Tara Randle	78023	92.3%	Wildflower
SA-6	Heather Wilk	78257	92.1%	Wildflower
SA-16	Joseph Vogal	78250	91.9%	Wildflower
TX-16	Bill Zimmer	75501	91.9%	NA
23H-112	Kim Mahan	78676	91.7%	Wildflower, Horsemint
23H-26	Ricka Mueller	78132	91.1%	Tallow
SA-33	Rick Fink	78238	90.3%	Clover, Blackberry
23H-31	Christine/Alan Black	78023	90.2%	Wildflower
SA-15	David Hunter	78006	90.1%	Chinese Tallow / TX Wildflower
TX-3	David Sebastian	75058	88.7%	NA
TX-45	Mark DeKiewiet	78266	87.8%	NA
SA-37	Peter Cowger	78006	87.6%	Wildflower
23H-49	Lily C & Catherine G	78006	87.3%	NA
23H-40	Linda Williams	78063	87.0%	Chinese Tallow / TX Wildflower
23H-50	Victoria Laubach	78132	87.0%	

TX Honeys compared with Commercial Manuka Honeys

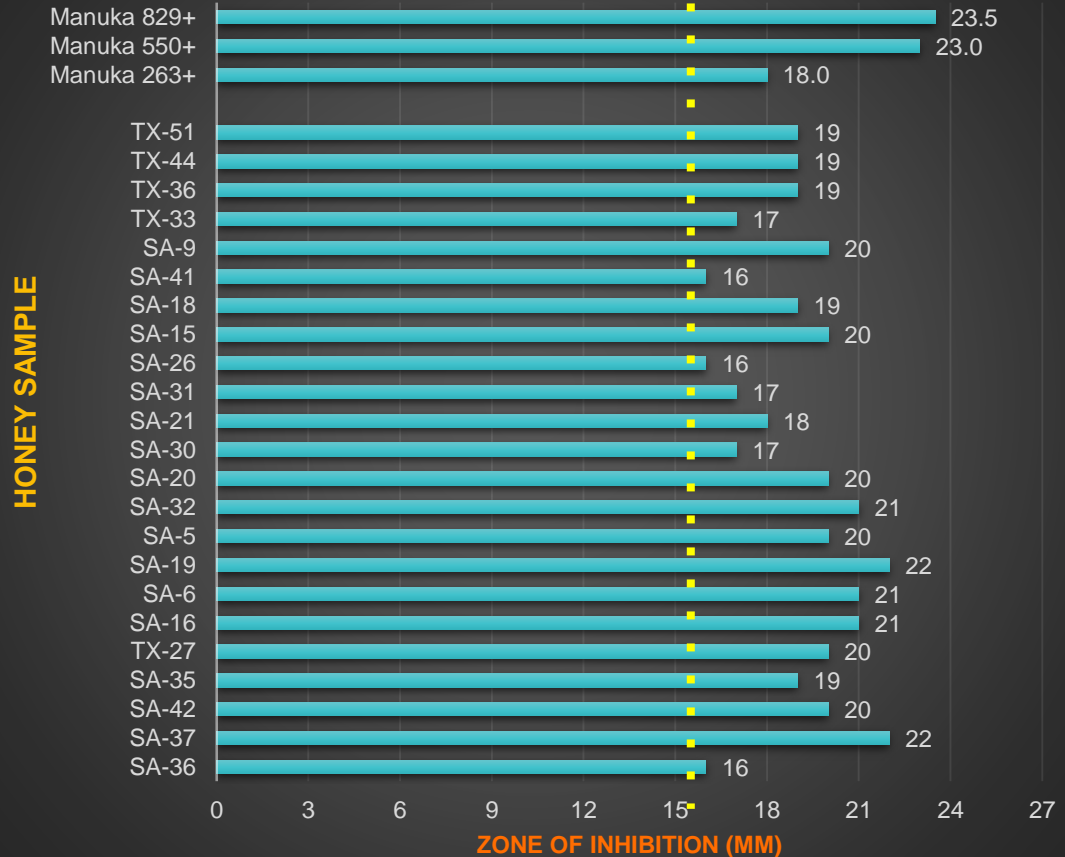
Zone of Inhibition (Zoi)

Weak: < 11 mm

Moderate: ≤16 mm

Strong: >16 mm

Antibacterial Activity of Honeys

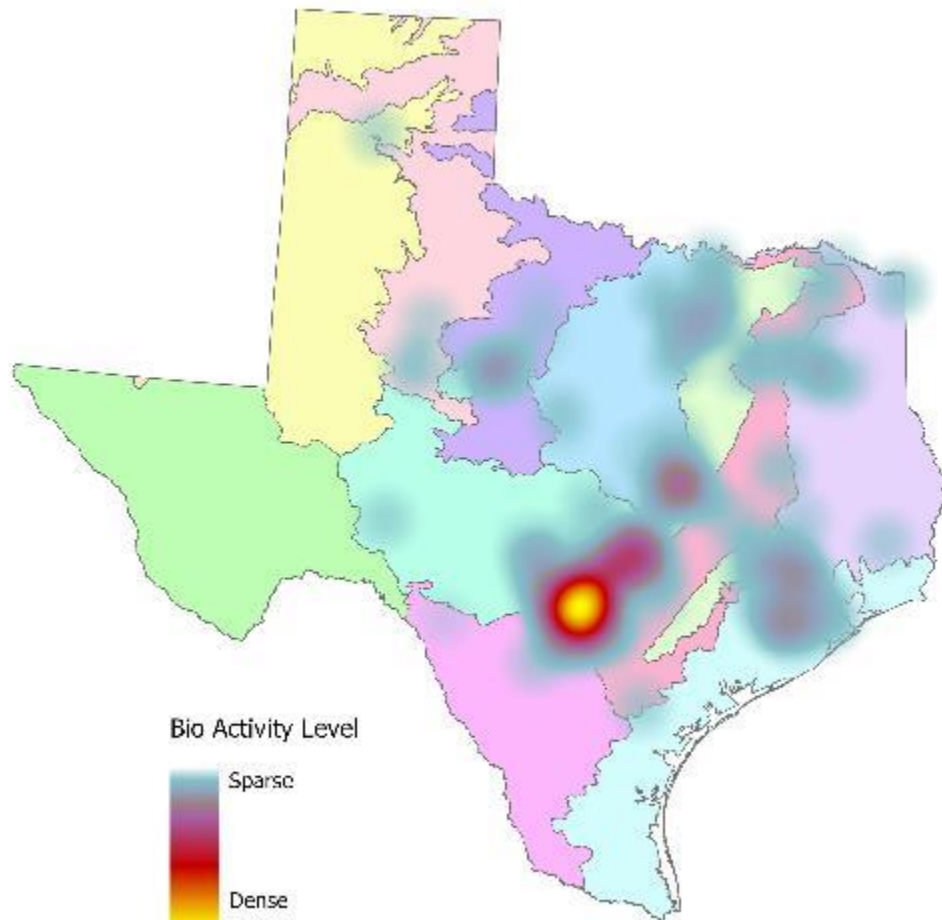


ECOLOGICAL AREAS OF TEXAS

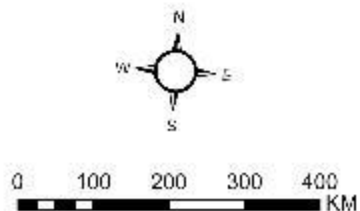
• SAMPLE POINT

ECOLOGICAL AREAS

- Arizona/New Mexico Mountains
- Central Great Plains
- Chihuahuan Deserts
- Cross Timbers
- East Central Texas Plains
- Edwards Plateau
- High Plains
- South Central Plains
- Southern Texas Plains
- Southwestern Tablelands
- Texas Blackland Prairies
- Western Gulf Coastal Plain



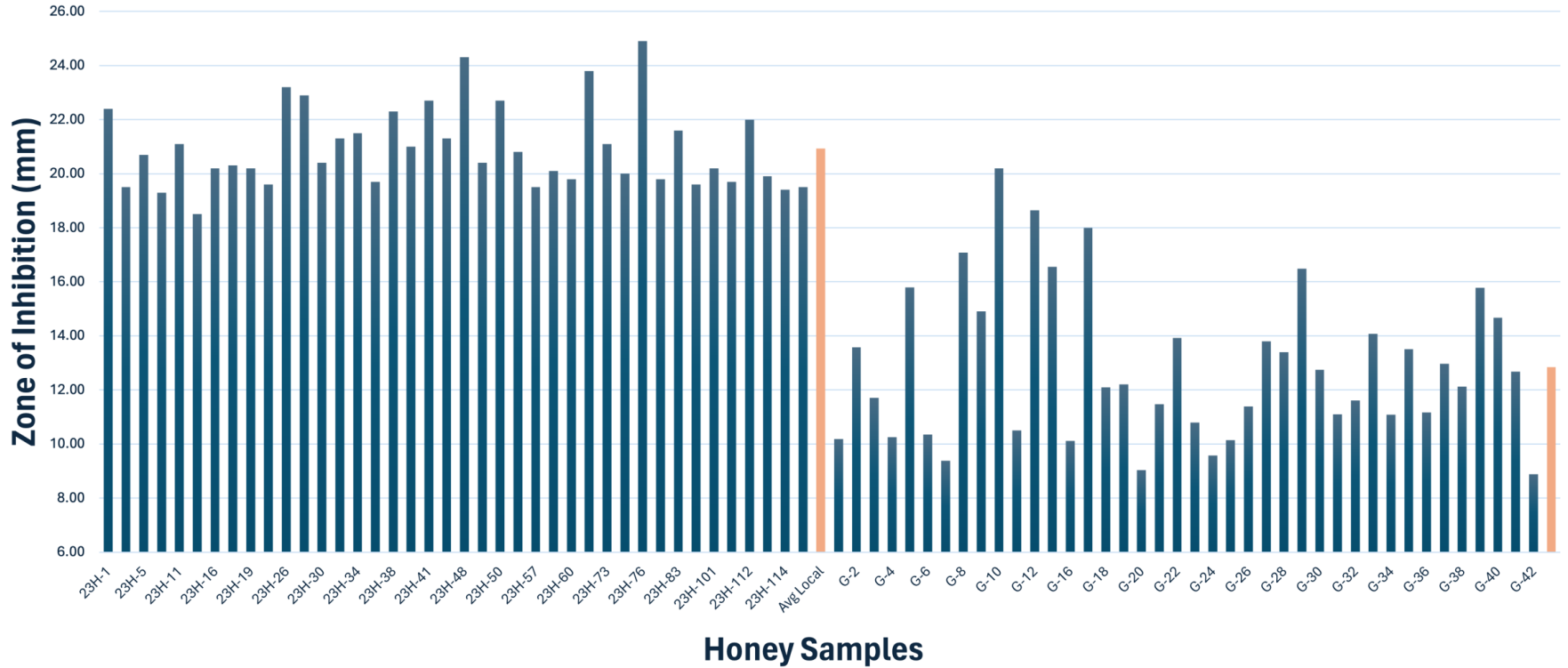
Bio Activity Level



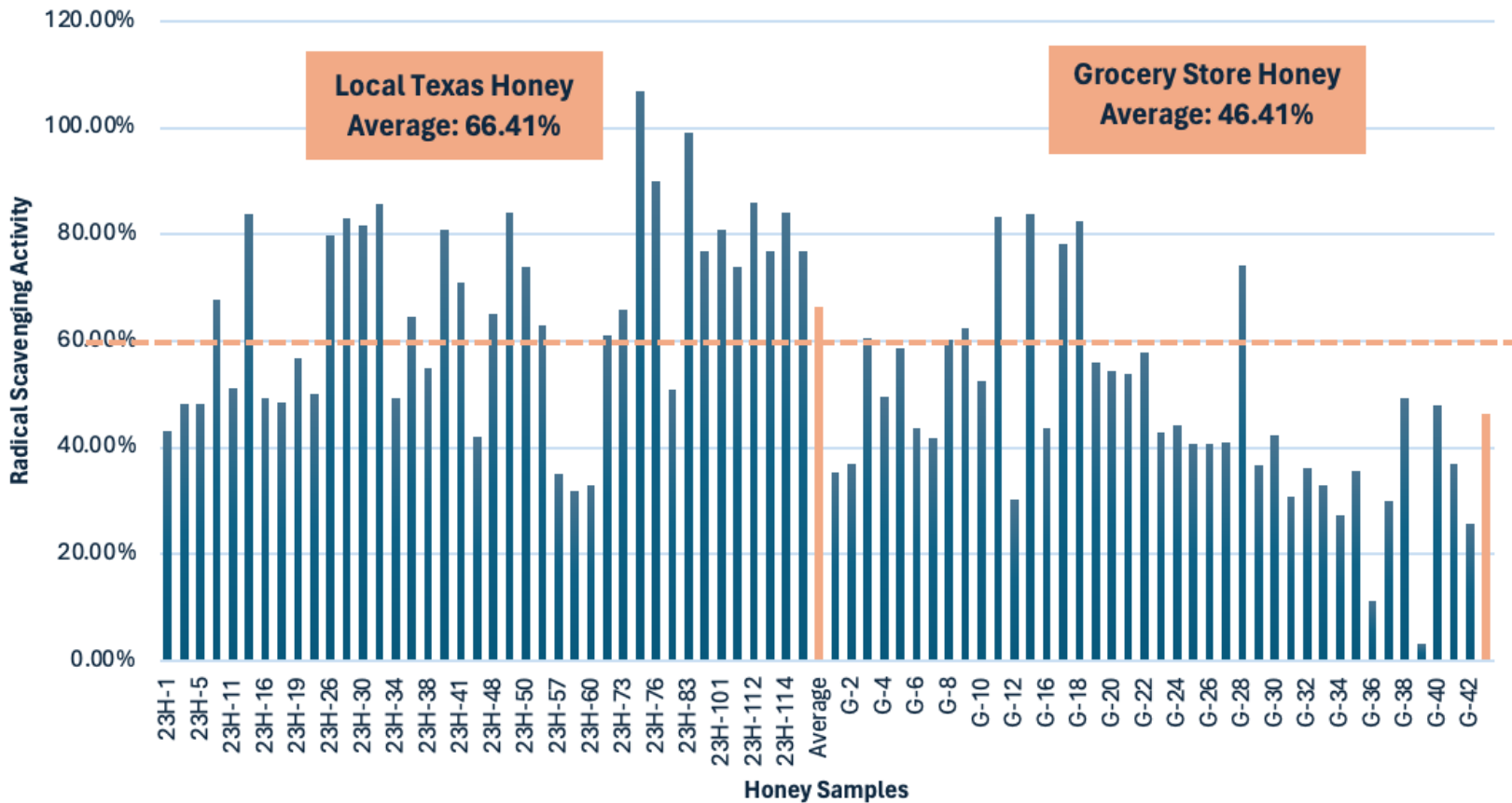
Antibacterial Activity (*Staphylococcus aureus*)

Local Texas Honey
Average 20.93

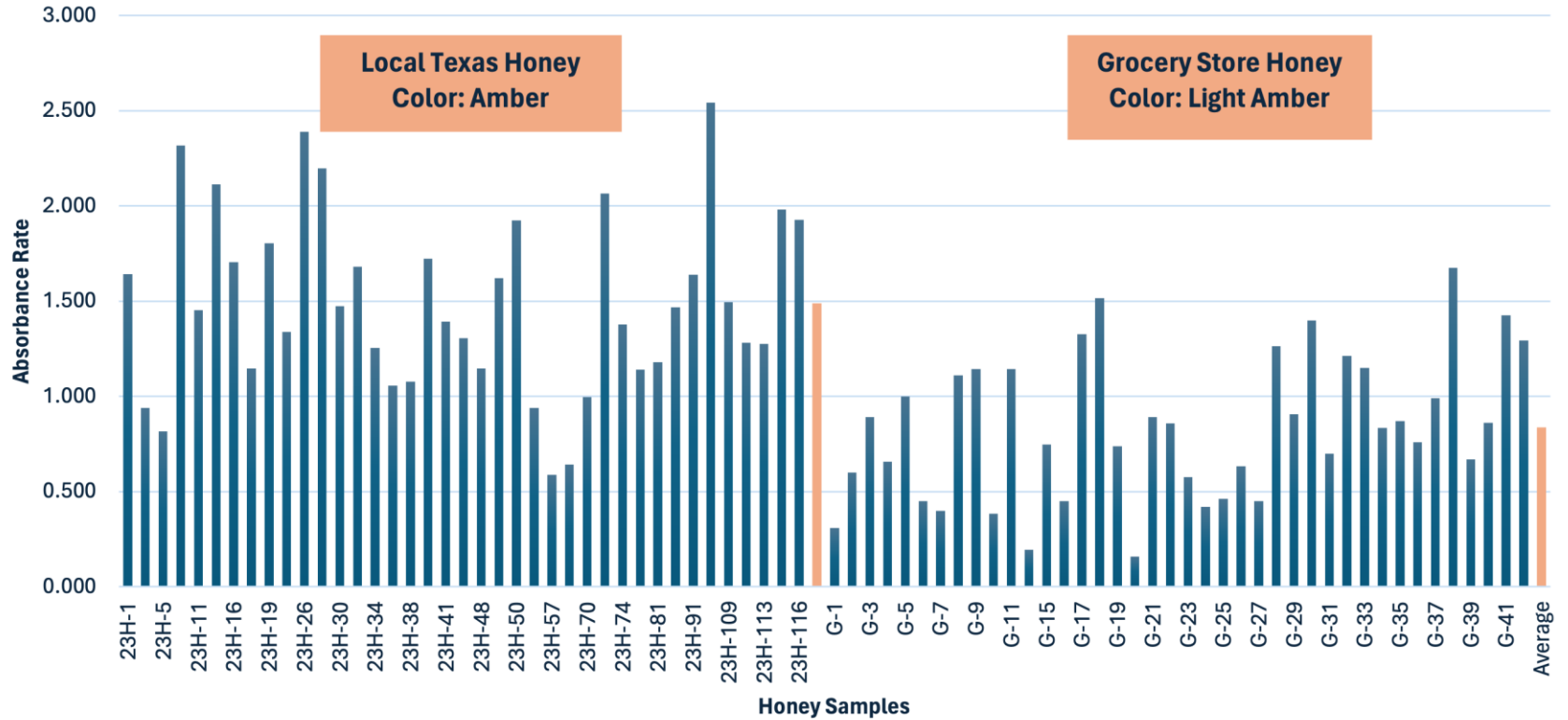
Grocery Store Honey
Average: 12.85



Antioxidant Activity (DPPH)



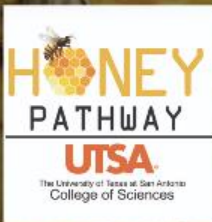
USDA Color Analysis Local Texas Honey vs. Grocery Store Honey



Which honeys have more medicinal potential (in general)?



- Local
- Dark
- Comb
Honey



HONEY Pathway Research Posters

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Antimicrobial Properties of Local TX Honey

1. ***Staphylococcus aureus*** vs. Local TX Honey: Antimicrobial Activity of 120 Local TX Honey against the Causative agent of Staph Infection (*Gracie Joao and Tena Awatu-Utunedi*)
2. ***Streptococcus Pyogenes*** vs. Local TX Honey: Antimicrobial Activity of Selected Local TX Honey against the Causative agent of Throat Infection (*Kyra Hagan and Christine Tonydas*)
3. ***Streptococcus oralls*** vs. Local TX Honey: Antimicrobial Activity of Selected Local TX Honey against the Causative agent of Dental Cavities (*Claudia Ponce and Jason Rodriguez*)
4. ***Cutibacterium Acnes*** vs. Local TX Honey: Antimicrobial Activity of Selected Local TX Honey against the Causative Agent of Acne Vulgaris (*Victoria Garcia and Trina Nguyen*)

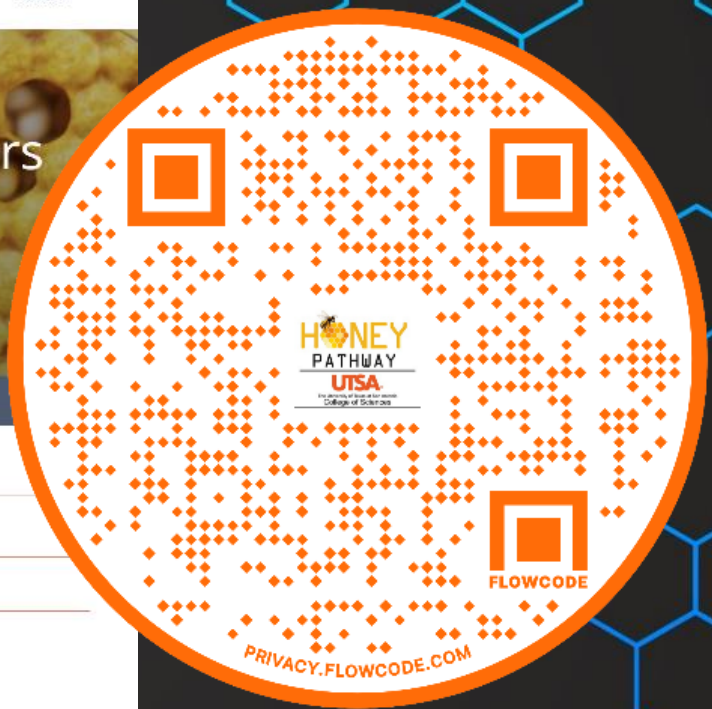
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Conclusions

- TX Honeys meet the physicochemical criteria
- Antimicrobial and antioxidant properties vary among honeys
- San Antonio local honeys have high antimicrobial potential (67%)
- TX Honeys have moderate to high antioxidant activity (33%)
- Honey samples high in bioactivity are mostly dark in color, but not always
- TX Honeys have **medical grade potential** against the nosocomial infections

**Please fill out this survey for our
HONEY Pathway**



Honey CURE Spring24



Acknowledgments



United States Department of Agriculture
National Institute of Food and Agriculture

**All honey sample donors
and beekeeper
associations**



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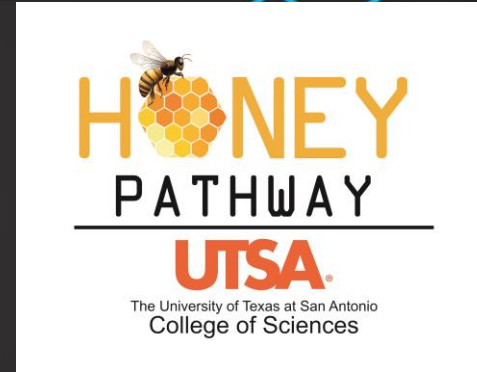
Thank You

Questions?



Ferhat Ozturk, Ph.D.

University of Texas San Antonio



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HoneyPathway@UTSA.edu