

From Hives of Texas to the Lab

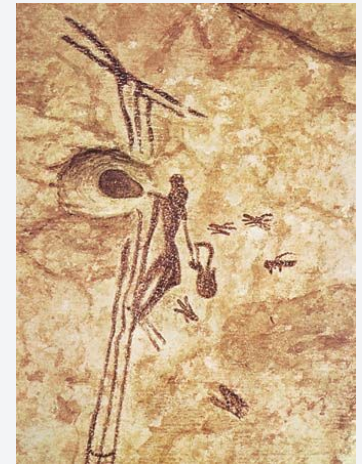
Analysis of antimicrobial and antioxidant activities of Texas honey samples for potential wound-healing use

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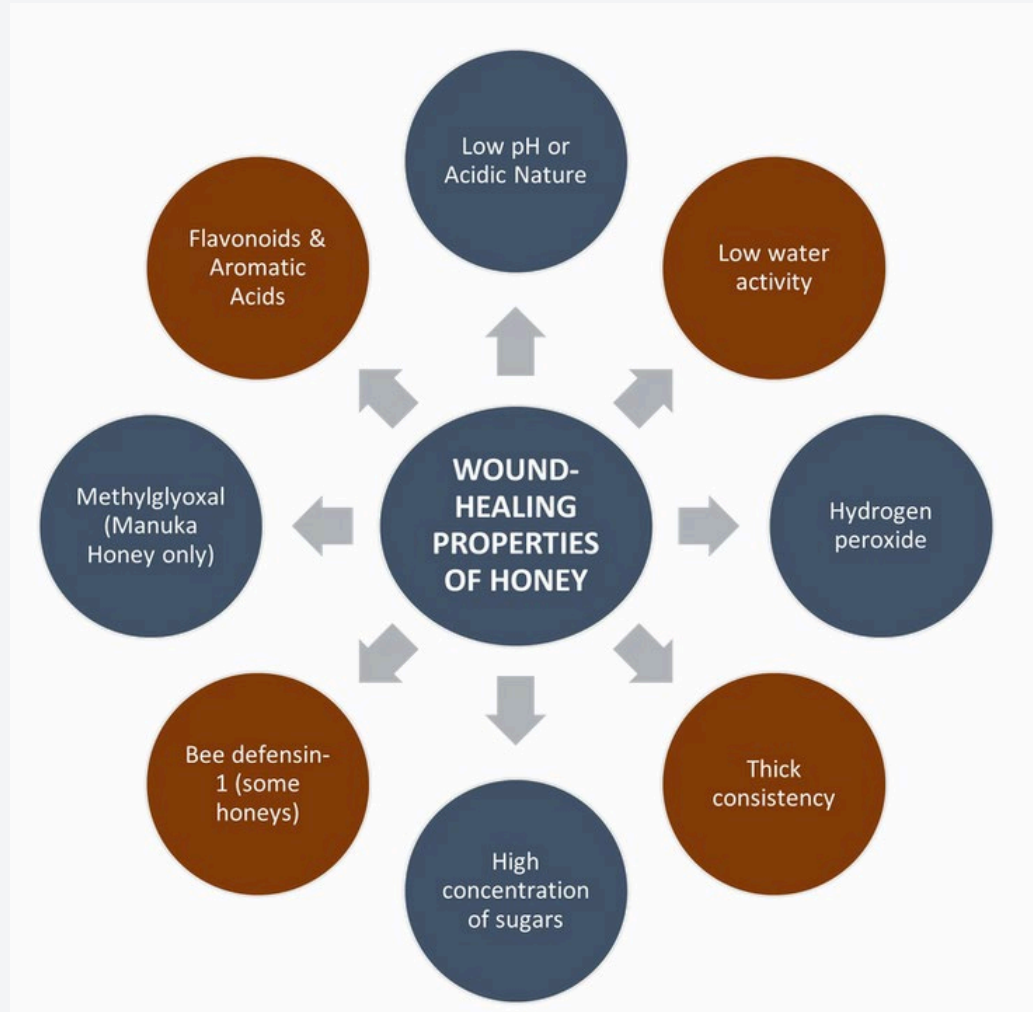
Kiyomi Konishi
Junior, Biology
Undergraduate

Background

- History of Honey
 - Used for Medicinal Purposes by Ancient Civilizations
 - Egyptians, Assyrians, Chinese, Greeks and Romans
 - Over 500 Prescriptions in Ancient Egypt Alone

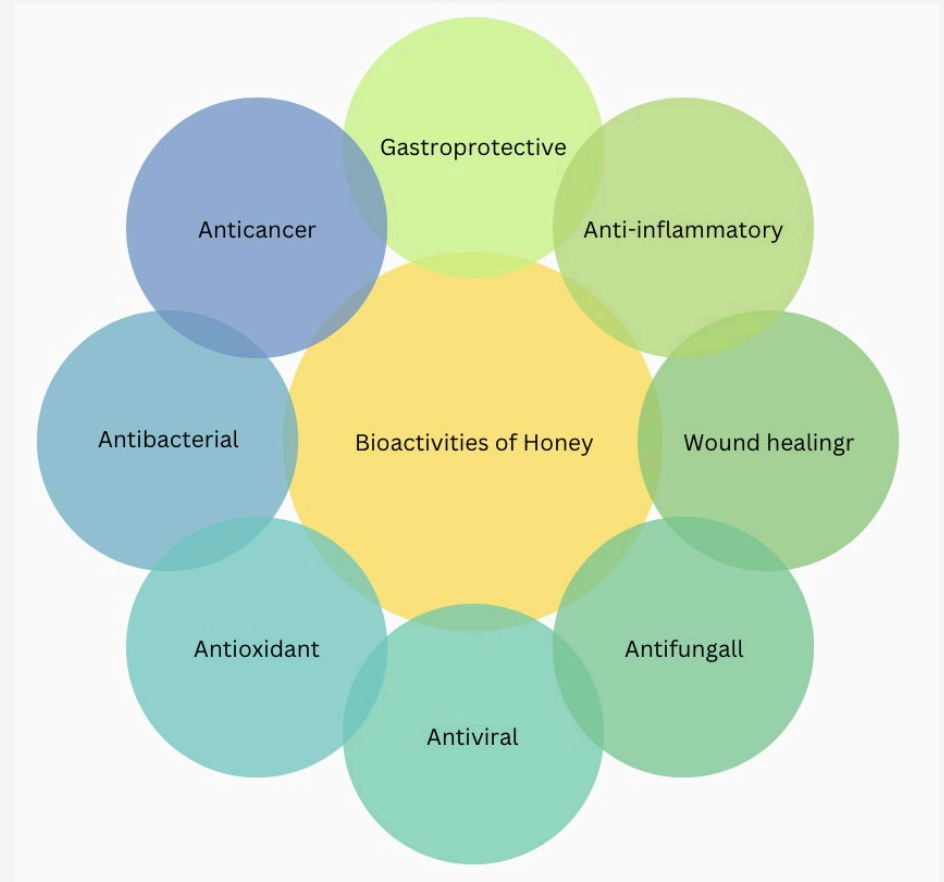


Background



Background

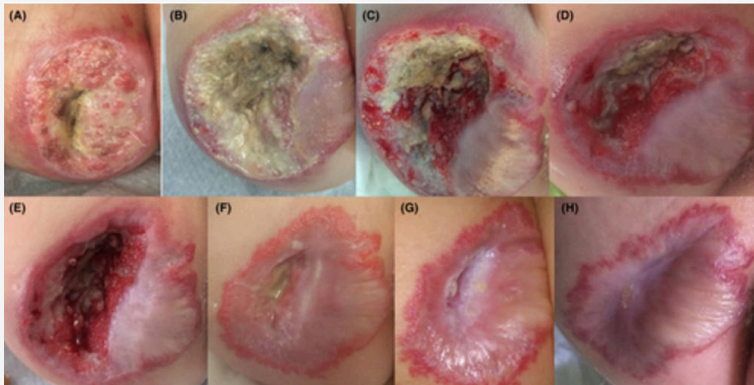
- Medicinal Properties
 - Antimicrobial property
 - Antioxidant property
- Growing trend in recent years in conducting research and clinical trials on the medicinal property use of honey



WARNING
graphic content

Background

- Clinical Trial Examples: Wound Healing



Ulcerated hemangioma in a 7-month-old baby



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



Figure 2. (A-C) Case 2. Varicose ulcer with 6 weeks time to healing.

Purpose

- Goal: To evaluate the bioactivity potential of Texas honey
- Aim: To identify the most potent sample of Texas honey for potential clinical trials
- This study is the first to analyze the medicinal properties of Texas honey, providing new and valuable insights into its potential therapeutic uses

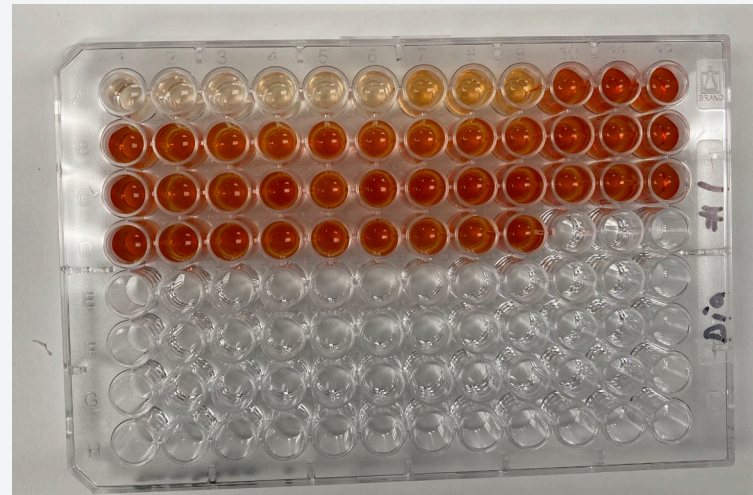
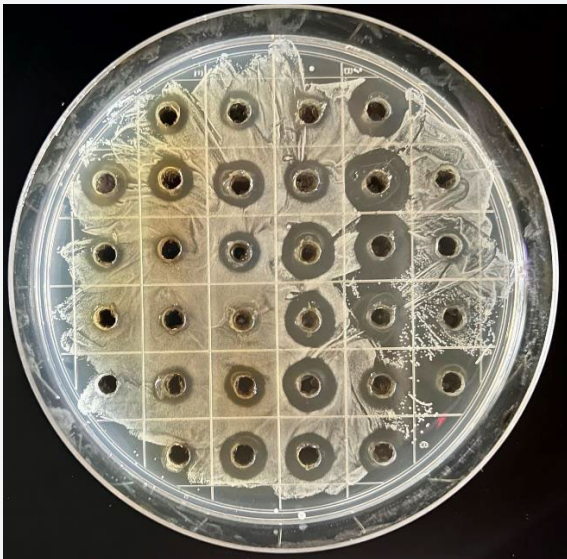
Hypothesis

- Based on how honey has been used as medicine for thousands of years, we propose that some of the Texas honeys will possess high antioxidant and high antimicrobial property, making them strong candidate of medical grade honey

Methods

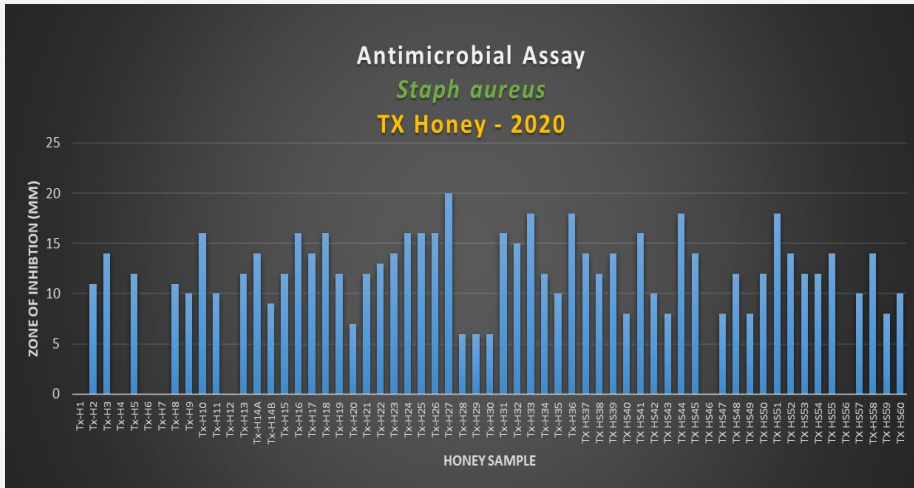
About 100 Texas honey samples were analyzed

- Antimicrobial properties
 - Zone of Inhibition
 - Against *Staphylococcus aureus*
 - XTT metabolic activity assay
- Antioxidant properties
 - TPC
 - TFC
 - DPPH
 - FRAP

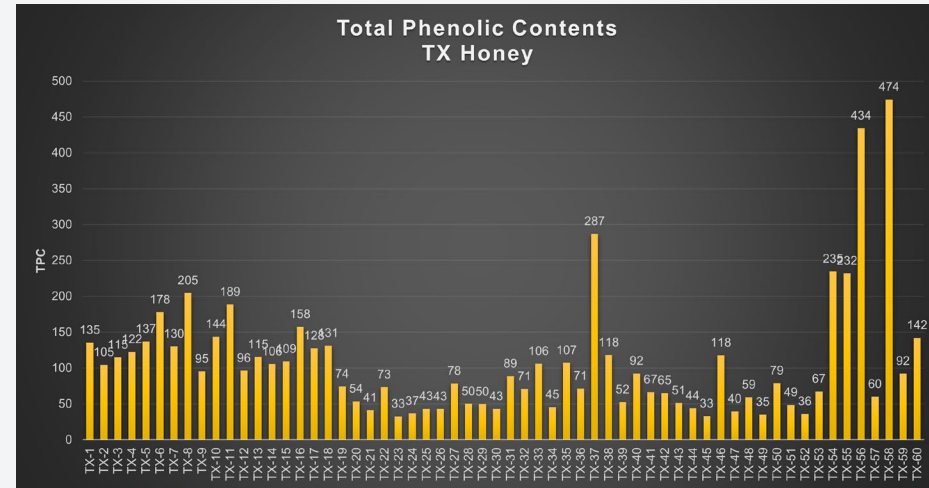


Results

- Antimicrobial Properties and Antioxidant Properties of Texas Honey Samples



Zone of Inhibition (Zoi)
 Weak: <11 mm
 Moderate: \leq 16 mm
 Strong: >16 mm



43% of samples are above 100 GAE (gallic acid equivalent)

Results:

Sample ID	Beekeeper	Zol mm
Tx-H1	Steven B Pool/Tribute Honey Co	0
Tx-H2	John Swan Wicked Bee	11
Tx-H3	David Sebastian	14
Tx-H4	James & Sylvia Russell	0
Tx-H5	Dodie Stillman	12
Tx-H6	Bert Acosta	0
Tx-H7	Nanette Davis	0
Tx-H8	Teri Albright	11
Tx-H9	Owen Smith	10
Tx-H10	John Swan Wicked Bee	16
Tx-H11	Nisha Coker	10
Tx-H12	Greg Oermann	0
Tx-H13	Mike Jurek	12
Tx-H14	Jimmy Middlebrooks	14
Tx-H15	Sonia Hogeland	12
Tx-H16	Bill Zimmer	16
Tx-H17	Chris Cook	14
Tx-H18	Andrew Bernig	16
Tx-H19	Dex Rogers	12
Tx-H20	Debbie Kober	7
Tx-H21	Stacy Smith	12
Tx-H22	Andrew & Tammy Dillingham	13
Tx-H23	Andrew & Tammy Dillingham	14
Tx-H24	Katrina Semones	16
Tx-H25	Jimmie Oakley	16
Tx-H26	Katrina Semones	16
Tx-H27	Greg Oermann	20
Tx-H28	Pamela Yeamans	6
Tx-H29	Donovan V Johns	6
Tx-H30	Daniel Brantner	6

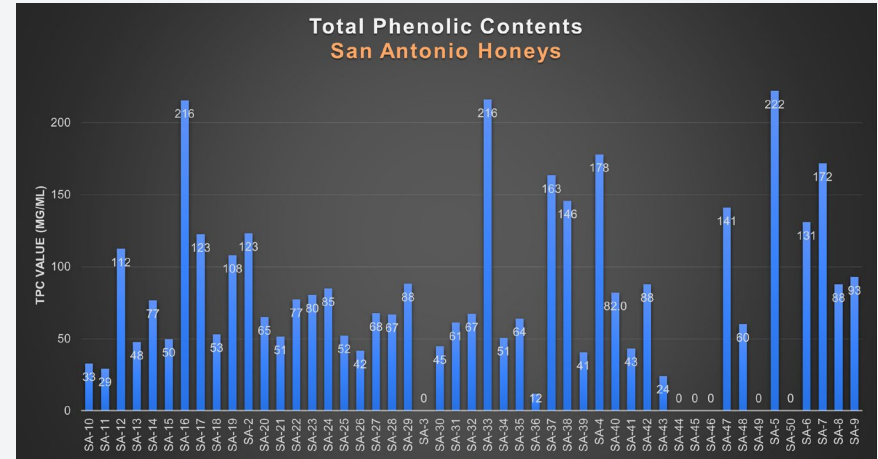
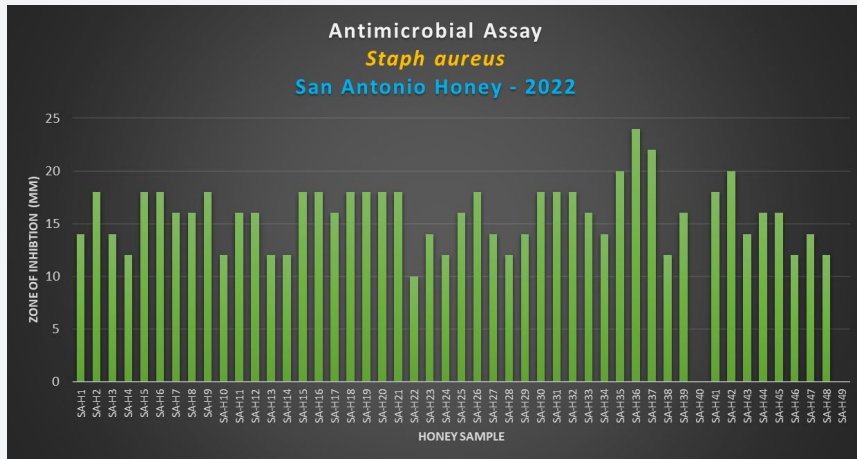
Sample ID	Beekeeper	Zol mm
Tx-H31	Vaughan	16
Tx-H32	Saundra Smith	15
Tx-H33	James Nielson	18
Tx-H34	Ken Milam	12
Tx-H35	Shiela Thorne	10
Tx-H36	Amy & Jason Dunsmore	18
TX HS37	Buckwheat MI	14
TX HS38	Oak Honey TR	12
TX HS39	Heather Honey (Ankara - Caliskan)	14
TX HS40	Natural Honey - Ali Baba Grocery	8
TX HS58	Cibolo Creek (Mark DK)	16
TX HS42	Kirkland Raw Honey (Costco)	10
TX HS43	HEB Raw Honey	8
TX HS44	Geronimo Honey (Mark DK)	18
TX HS45	Bracken Honey (Mark DK)	14
TX HS46	Arizona Range Honey (Mark DK)	0
TX HS47	Wild Raw Argentinian Honey	8
TX HS48	Eucalyptus Honey (Bee Power - Australia)	12
TX HS49	Arasely Silva	8
TX HS50	L-Mesitran Honey	12
TX HS51	Walker #1	18
TX HS52	Walker #2	14
TX HS53	Walker #3	12
TX HS54	Walker #4 (Buckwheat)	12
TX HS55	Propolis Box	14
TX HS56	L-Mesitran Wound Gel / Honey	0
TX HS57	Comb Honey Michigan	10
TX-HS58	Anatolia Life Propolis	14
TX HS59	Black Seed Honey	8
TX HS60	Stingless Bee Honey	10

Results

Sample ID	TPC	Donor	Nectar	Sample ID	TPC	Donor	Nectar
TX-1	135	Steven B Pool/Tribute Honey Co		TX-31	89	Vaughan	
TX-2	105	John Swan Wicked Bee	Goldenrod	TX-32	71	Sandra Smith	
TX-3	115	David Sebastian	Wildflower	TX-33	106	James Nielson	Tx Whitebrush/beebrush
TX-4	122	James & Sylvia Russell	Crimson clover	TX-34	45	Ken Milam	Poison Oak/Tallow
TX-5	137	Dodie Stillman	Wildflower	TX-35	107	Shiela Thorne	
TX-6	178	Bert Acosta		TX-36	71	Amy & Jason Dunsmore	Buckwheat
TX-7	130	Nanette Davis		TX-37	287	Joan Mandell - GreenAcres	Oak Honeydew
TX-8	205	Teri Albright	Wildflower, persimmon	TX-38	118	Kirikkale Honey	Heather
TX-9	95	Owen Smith		TX-39	52	Ismail Caliskan	Natural Dark Honey
TX-10	144	John Swan Wicked Bee	Mesquite, horsemint, wildflower	TX-40	92	Ali Baba Grocery - San Antonio	Cibolo Creek
TX-11	189	Nisha Coker		TX-41	67	Mark DeKiewiet	Raw Honey
TX-12	96	Greg Oermann ?	Indian blanket/wildflower	TX-42	65	Kirkland Raw Honey	
TX-13	115	Mike Jurek	Wildflower	TX-43	51	HEB Raw Honey	Geronimo Honey
TX-14	106	Jimmy Middlebrooks		TX-44	44	Mark DeKiewiet	Bracken Honey
TX-15	109	Sonia Hogeland	Mesquite	TX-45	33	Mark DeKiewiet	Arizona Range Honey
TX-16	158	Bill Zimmer		TX-46	118	Mark DeKiewiet	Wild flowers
TX-17	128	Chris Cook		TX-47	40	Wild Raw Argentinian Honey	Eucalyptus Honey
TX-18	131	Andrew Bernig	Wildflower	TX-48	59	Bee Power - Australia	
TX-19	74	Dex Rogers	Wildflower	TX-49	35	Arasely Silva	L-Mesitran
TX-20	54	Debbie Kober		TX-50	79	L-Mesitran Honey	Gaillardia
TX-21	41	Stacy Smith		TX-51	49	Walker Honey Farms #1	Horsemint (Monarda Sps.)
TX-22	73	Andrew & Tammy Dillingham		TX-52	36	Walker Honey Farms #2	Yaupon Holly
TX-23	33	Andrew & Tammy Dillingham		TX-53	67	Walker Honey Farms #3	Buckwheat
TX-24	37	Katrina Semones		TX-54	235	Walker Honey Farms #4	Propolis
TX-25	43	Jimmie Oakley	Gaillardia	TX-55	232	Propolis Box	Wound Gel
TX-26	43	Katrina Semones		TX-56	434	L-Mesitran Wound Gel / Honey	
TX-27	78	Greg Oermann	Wildflower/ Pecan honeydew	TX-57	60	Comb Honey Michigan	Propolis
TX-28	50	Pamela Yeamans	Gaillardia, Mesquite	TX-58	474	Anatolia Life Propolis	Black Seed
TX-29	50	Donovan V Johns	Pumpkin, cotton, lakeweed	TX-59	92	Black Seed Honey	
TX-30	43	Daniel Brantner		TX-60	142	Stingless Bee Honey	

Results

- Antimicrobial Properties and Antioxidant Properties of San Antonio Honey Samples



Zone of Inhibition (Zoi)

Weak: <11 mm

Moderate: \leq 16 mm

Strong: >16 mm

26% of samples are above 100

Results

Sample ID	Beekeeper	Zol mm
SA-H1	Joseph Matthew Vogel	14
SA-H2	Nathalie B.	18
SA-H3	Mary Jo Hansen	14
SA-H4	Ylva Karlsson	12
SA-H5	Heather Wilk	18
SA-H6	Heather Wilk	18
SA-H7	Heather Wilk	16
SA-H8	Linda Williams	16
SA-H9	Linda Williams	18
SA-H10	Glenn & Monica Kveton	12
SA-H11	Glenn & Monica Kveton	16
SA-H12	Rick Fink	16
SA-H13	Rick Fink	12
SA-H14	Rick Fink	12
SA-H15	David Hunter	18
SA-H16	Joseph Vogel	18
SA-H17	Amy Cox	16
SA-H18	Carrie Ortiz	18
SA-H19	Johnny D Monteverdi	18
SA-H20	Chris Black	18
SA-H21	Johnny D Monteverdi	18
SA-H22	Richard Shaw	10
SA-H23	Matt Conrad	14
SA-H24	Virginia Zepnick	12
SA-H25	Johnny D Monteverdi	16

Sample ID	Beekeeper	Zol mm
SA-H26	Johnny D Monteverdi	18
SA-H27	Johnny D Monteverdi	14
SA-H28	Johnny D Monteverdi	12
SA-H29	Cathy Hardy	14
SA-H30	Ernesto Rocha	18
SA-H31	Jeff Jackson	18
SA-H32	Disa Campbell	18
SA-H33	Rick Fink	16
SA-H34	Rob Holliday	14
SA-H35	Rob Holliday	20
SA-H36	Cristin Bartsch	24
SA-H37	Peter Cowger	22
SA-H38	Kristie Just	12
SA-H39	Kristie Just	16
SA-H40	Dianna Res	0
SA-H41	Jeannie McDaniel	18
SA-H42	Randy & Tara Randle	20
SA-H43	James Watson	14
SA-H44	Sandra Meckel & R. Harris	16
SA-H45	Patrick Moran	16
SA-H46	Patrick Moran	12
SA-H47	Vicky Kennedy	14
SA-H48	Osman Dulgeroglu	12
SA-H49	Osman Dulgeroglu	0

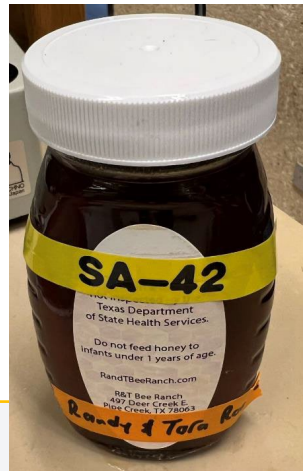
Results

Sample	TPC	Donor	Nectar
SA-1	N/A	Joseph Matthew Vogel	Unknown
SA-2	123	Nathalie B.	wildflower / native persimmon
SA-3	N/A	Mary Jo Hansen	Unknown
SA-4	178	Ylva Karlsson	: pollen, white horehound, Agc
SA-5	222	Heather Wilk	Oak
SA-6	131	Heather Wilk	Oak
SA-7	172	Heather Wilk	Oak
SA-8	88	Linda Williams	Oak and Elm tree
SA-9	93	Linda Williams	Oak and Elm tree
SA-10	33	Glenn & Monica Kveton	Wildflower
SA-11	29	Glenn & Monica Kveton	Wildflower
SA-12	112	Rick Fink	Wildflower
SA-13	48	Rick Fink	Cotton & Chilly
SA-14	77	Rick Fink	Mesquite & Anaqua
SA-15	50	David Hunter	N/A
SA-16	216	Joseph Vogal	Vak
SA-17	123	Amy Cox	Wildflower
SA-18	53	Carrie Ortiz	Wildflower
SA-19	108	Johnny D Monterverdi	N/A
SA-20	65	Chris Black	N/A
SA-21	51	Johnny D Monteverdi	N/A
SA-22	77	Richard Shaw	N/A
SA-23	80	Matt Conrad	N/A
SA-24	85	Virginia Zepnick	Cedar, Oak, Elm
SA-25	52	Johnny D Monteverdi	N/A

Sample	TPC	Donor	Nectar
SA-26	42	Johnny D Monteverdi	N/A
SA-27	68	Johnny D Monteverdi	N/A
SA-28	67	Johnny D Monteverdi	N/A
SA-29	88	Cathy Hardy	N/A
SA-30	45	Ernesto Rocha	Wildflower, Mesquite
SA-31	61	Jeff Jackson	N/A
SA-32	67	Disa Campbell	N/A
SA-33	216	Rick Fink	N/A
SA-34	51	Rob Holliday	wildflower
SA-35	64	Rob Holliday	Wildflower
SA-36	12	Cristin Bartsch	
SA-37	163	Peter Cowger	n/A
SA-38	146	Kristie Just	
SA-39	41	Kristie Just	
SA-40	82.0	Dianna Res	Pollen and Sugar
SA-41	43	Jeannie McDaniel	Wild Flowers,guajillo,bee bust
SA-42	88	Randy & Tara Randle	Wild Flowers
SA-43	24	James Watson	
SA-44	N/A	Sandra Meckel &R.Harris	N/A
SA-45	N/A	Patrick Moran	
SA-46	N/A	Patrick Moran	
SA-47	141	Vicky Kennedy	wildflower
SA-48	60	Osman Dulgeroglu	Blueberry Farm
SA-49	N/A	Osman Dulgeroglu	Blueberry Farm
SA-50	N/A	Jim and Debbie Pruett	Brush/Mesquite

Conclusion and Observation

- Honey's antimicrobial and antioxidant properties vary
- San Antonio local honeys have high antimicrobial potential (67%)
- San Antonio sample group has fewer samples with high antioxidant potential
- More San Antonio honey samples have high antimicrobial AND antioxidant properties, making them great candidates for wound healing agent
- Honey samples high in bioactivity are mostly dark in color, but not always



Next Step: From the Lab to the Clinic

- Identified highest bioactivity potential of honeys
- Collecting more honey from beekeeper for further testing
- Gamma sterilizing honey samples for animal and human wound healing trials
- Conducting clinical trials on patients with different wounds
- Monitoring patients throughout the healing process using highest potential Texas honey sample

Acknowledgement

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Nhi Ho, Undergraduate Student

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Questions?

- Contact information
- Kiyomi Konishi
 - Kiyomi.Konishi@my.utsa.edu
- Ferhat Ozturk, PhD
 - ferhat.ozturk@utsa.edu

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