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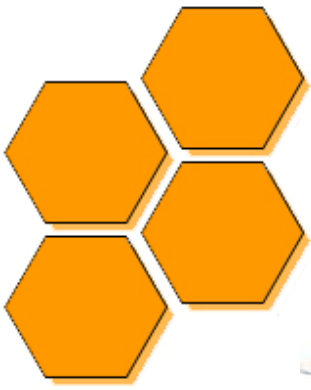
QUÉBEC - CANADA

# **Study of Possible Transmission of Bacteria, Clinically Important for Humans, Through a Hymenoptera Sting**



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# Bees, wasp, hornets, bumblebees: **THEY STING!**

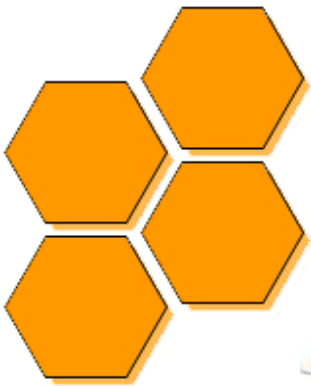


## Hymenoptera sting

- ▶ to defend their selves
- ▶ to defend their nest



- Honeybees' first (and last) stinging leads to their death



# Bees, wasp, hornets, bumblebees: **THEY STING!**



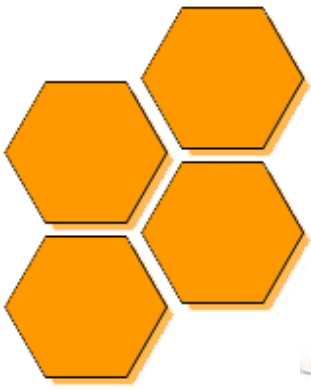
## **TARGETS:**

**Insects**

**Reptiles**

**Mammals (humans included)**





# Bees stinging: Impact to humans

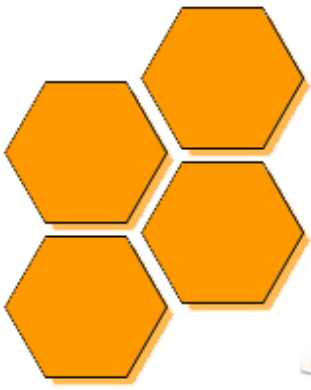


## Stinging might induce:



mild symptoms

- Burning pain at the sting site
- A red welt at the sting area
- Slight swelling around the sting area



## Bees stinging: Impact to humans



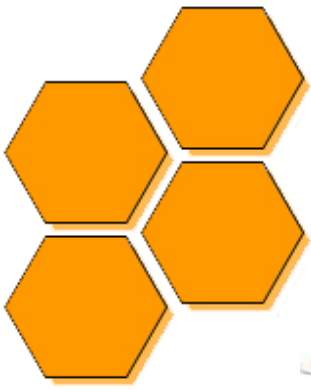
### Stinging might induce:



moderate symptoms

- Extreme redness

- Swelling at the site of the sting that gradually enlarges (1-3 days)



# Bees stinging: Impact to humans

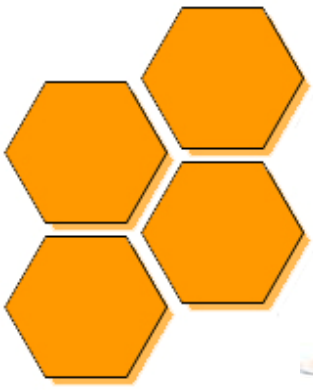


## Stinging might induce:



### Severe allergic reaction

- Skin reactions, including itching and flushed or pale skin
  - Difficulty breathing
  - Swelling of the throat and tongue
  - A weak, rapid pulse
  - Vomiting or diarrhea
  - Dizziness or fainting
  - Loss of consciousness



## Bees stinging: Impact to humans

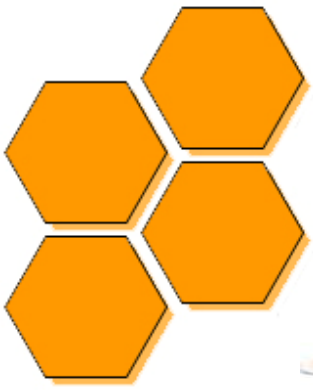


**In some rare cases, stinging might  
induce:**

**-Anaphylactic shock**

**-Death**





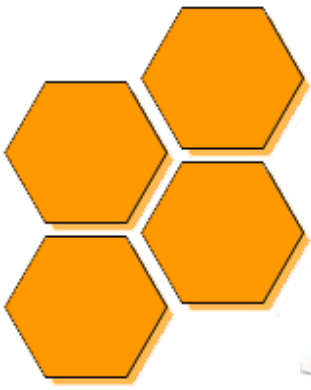
# Bees stinging: Impact to humans



...a different kind of problems







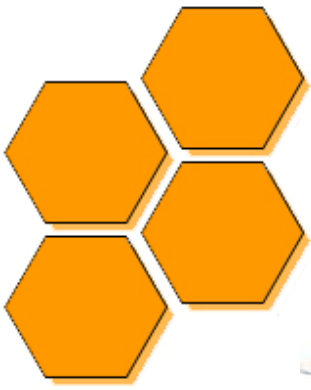
# Bees stinging: Impact to humans



**On the other hand...**



**Bee venom and bee sting-acupuncture is extensively used in  
Apitherapy**

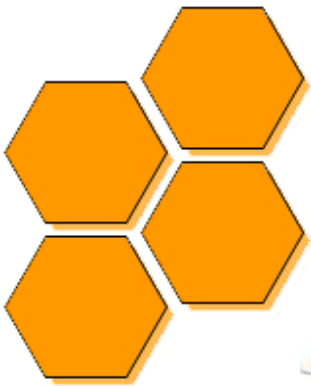


# Bees stinging: Impact to humans



**The question:**

**“can a honeybee stinger transmit a  
pathogen into my body?”**



# Literature

*It has been suggested that the sting of the honeybees can induce pathogenesis or can even be fatal for humans, as a result of the transmission of bacterial pathogens from the stinger to subjects' bodies.*

## Fatal Infection after a Bee Sting

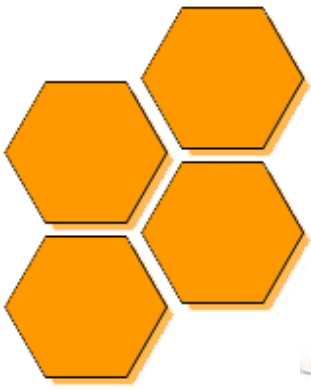
Alexander M. Truskinovsky, James D. Dick, and Grover M. Hutchins

Department of Pathology, The Johns Hopkins Medical Institutions, Baltimore

Life-threatening or even fatal infections can rarely develop after bee stings.

**Clinical Infectious Diseases** 2001;32:e36–8

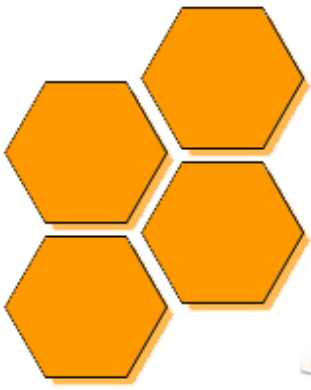
© 2001 by the Infectious Diseases Society of America.



# The experiments



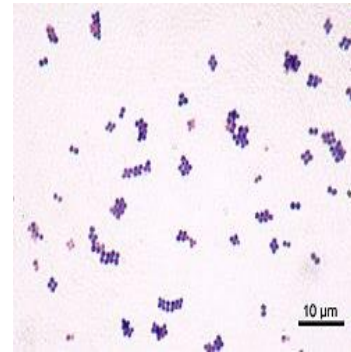
We investigated the possibility of the transmission of some bacteria, clinically important for humans, via the sting or even through simple contact with honeybees



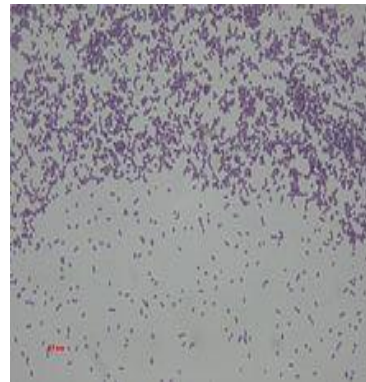
# The pathogens



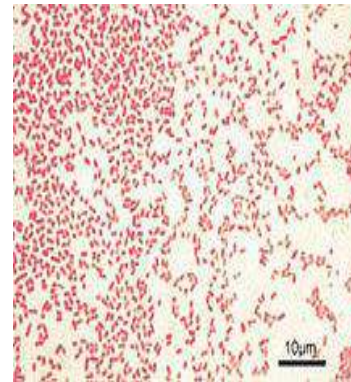
*Streptococcus pyogenes*



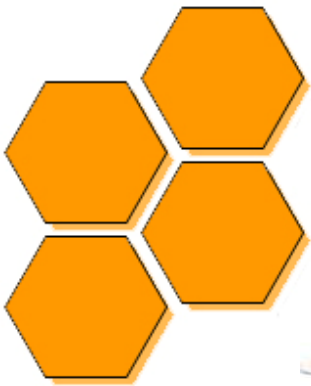
*Staphylococcus aureus*



*Enterococcus  
faecalis/faecium*



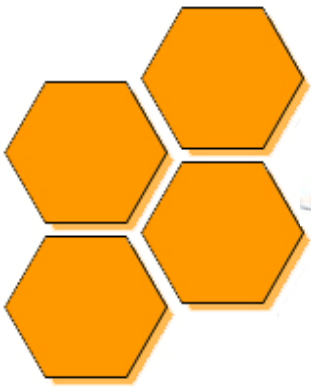
*Pseudomonas aeruginosa*



# Sampling and application

- 288 forager honeybees
- simulation of stinging with live honeybees stinging directly the nutrient substrates
- honeybees were forced to sting sterilized leather (human skin simulation) and immediately afterwards the sting apparatus was transferred to the nutrient substrates
- the legs were removed and were attached to the nutrient substrates



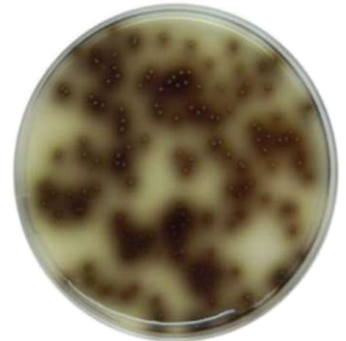


# Isolation agar media for targeted bacterial species

- ▶ Baird Parker agar supplemented with egg-yolk tellurite → **staphylococci**
- ▶ Blood Agar base supplemented with streptococcus selective supplement → **streptococci**
- ▶ Kanamycin Aesculin Azide agar → **enterococci**
- ▶ *Pseudomonas* CFC agar → **pseudomonas**



Baird Parker agar

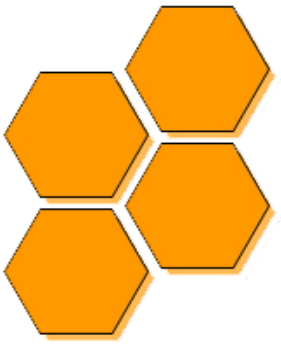


Kanamycin Aesculin Azide agar

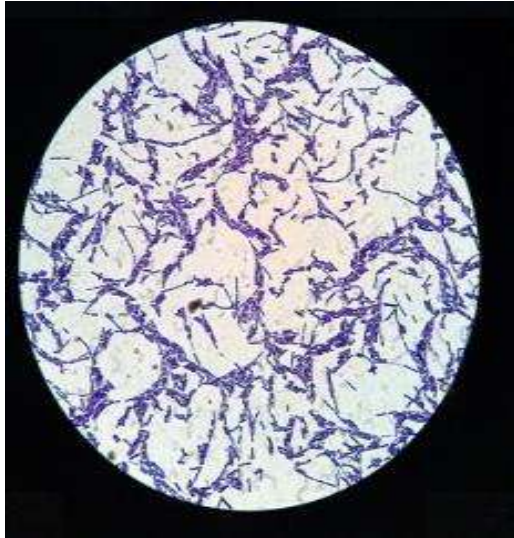


*Pseudomonas* CFC agar

stinging nutrient substrate											
BP agar (staphylococci)			BAB+COBA (streptococci)			KAA agar (enterococci)			Pseudomonas CFC agar (pseudomonas)		
N° of samples	N° of suspect samples	% suspect	N° of samples	N° of suspect samples	% suspect	N° of samples	N° of suspect samples	% suspect	N° of samples	N° of suspect samples	% suspect
24	2	8.3%	24	10	41.7%	24	0	0.0%	24	1	4.2%
stinging sterilized leather & transfer of sting apparatus to nutrient substrate											
BP agar (staphylococci)			BAB+COBA (streptococci)			KAA agar (enterococci)			Pseudomonas CFC agar (pseudomonas)		
N° of samples	N° of suspect samples	% suspect	N° of samples	N° of suspect samples	% suspect	N° of samples	N° of suspect samples	% suspect	N° of samples	N° of suspect samples	% suspect
24	0	0.0%	24	1	4.2%	24	1	4.2%	24	1	4.2%
removal of legs & placement onto the nutrient substrate											
BP agar (staphylococci)			BAB+COBA (streptococci)			KAA agar (enterococci)			Pseudomonas CFC agar (pseudomonas)		
N° of samples	N° of suspect samples	% suspect	N° of samples	N° of suspect samples	% suspect	N° of samples	N° of suspect samples	% suspect	N° of samples	N° of suspect samples	% suspect
24	1	4.2%	24	12	50.0%	24	0	0.0%	24	3	12.5%
<div>stinging nutrient substrate</div>			<div>sting apparatus to nutrient substrate</div>			<div>bag legs onto the nutrient substrate</div>					
N° of samples	N° of suspect samples	% suspect		N° of samples	N° of suspect samples	% suspect		N° of samples	N° of suspect samples	% suspect	
96	13	13.5%		96	3	3.1%		96	16	16.7%	



# Suspect colonies isolation and bacterial identification

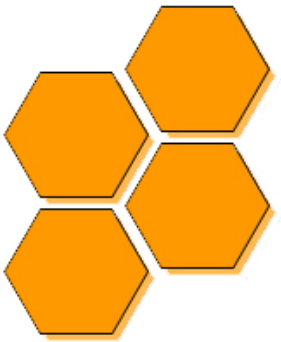


TOTAL		
N° of samples	N° of suspect samples	% suspect
288	32	11.1%



Suspect colonies recovered and proceeded to identification (following microscopic observation, Gram staining, catalase reaction)

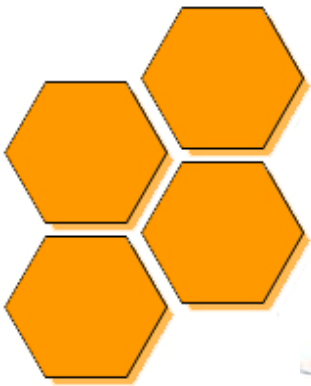
- 17 bacterial isolates were identified
- Other 13 colonies turned out to belong to yeast species
- 2 colonies did not re-grow.



# Suspect colonies isolation and bacterial identification

s/n	Bacterial species	Gram staining	Identification method
1	<i>Bacillus</i> sp.	+	partial 16S rDNA sequencing
2	<i>Bacillus</i> sp.	+	partial 16S rDNA sequencing
3	<i>Bacillus</i> sp.	+	partial 16S rDNA sequencing
4	<i>Paenibacillus urinalis</i>	-	MALDI-TOF
5	<i>Paenibacillus pabuli</i>	-	MALDI-TOF
6	<i>Staphylococcus capitis</i>	+	API-Staph
7	<i>Bacillus</i> sp.	+	partial 16S rDNA sequencing
8	<i>Bacillus</i> sp.	+	partial 16S rDNA sequencing
9	<i>Bacillus</i> sp.	+	partial 16S rDNA sequencing
10	<i>Enterobacter cloacae</i> *	-	API20E
11	<i>Micrococcus luteus</i>	+	API-Staph
12	<i>Staphylococcus cohnii</i>	+	API-Staph
13	<i>Staphylococcus warneri</i>	+	API-Staph
14	<i>Micrococcus luteus</i>	+	API-Staph
15	<i>Bacillus</i> sp.	+	partial 16S rDNA sequencing
16	<i>Staphylococcus warneri</i>	+	API-Staph
17	<i>Micrococcus luteus</i>	+	API-Staph

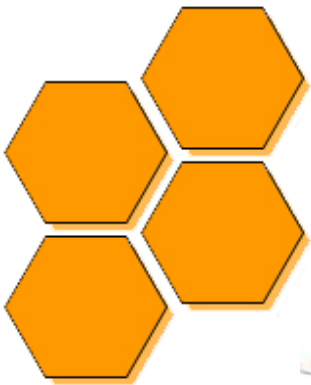
\*opportunistic pathogen (coliform)



# CONCLUSIONS

- ▶ **Despite the extended number of replications, **no** colonies of the 4 targeted pathogens were recovered**
- ▶ **This suggests that honeybees **do not** carry any of these specific hazardous microorganisms for humans here tested**

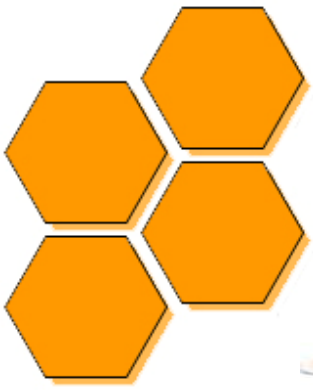




# CONCLUSIONS



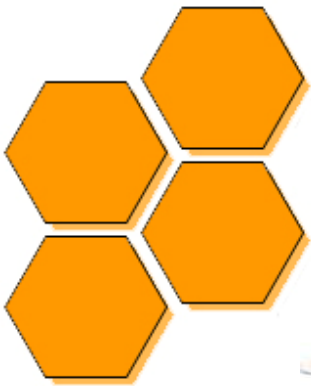




# And what about wasps or hornets?



8 *Vespa orientalis* and 32 *Vespoula germanica*  
26 suspect samples (32.5%)  
Majority: *Vespoula germanica* (legs)

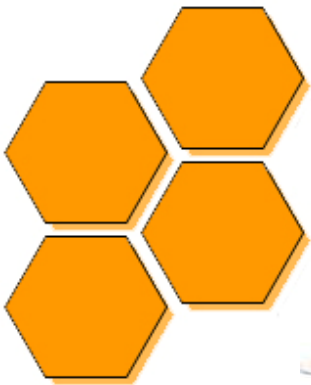


# Wasps and hornets?

- Both wasps and hornets are carnivorous
- They are also fed on dead bodies
- Harvest on garbage



**Results are expected soon...**

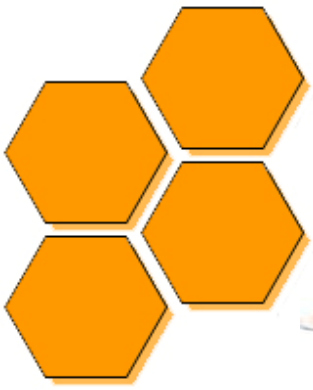


# Acknowledgements



beehealth





# Acknowledgements



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**PhD Student**