

# Alimentación suplementaria de alta calidad y su impacto en el rendimiento de la colmena

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¿QUIÉN USA ALIMENTO AHORA?



# most intense forest fires in recent years

## Spain

Over 200,000 hectares of land burned since the beginning of the year  
2,300 hectares reduced to ash in Galicia

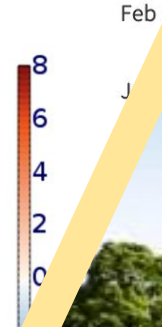
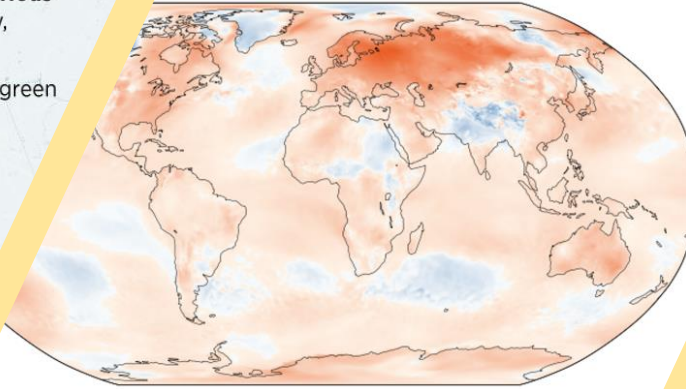
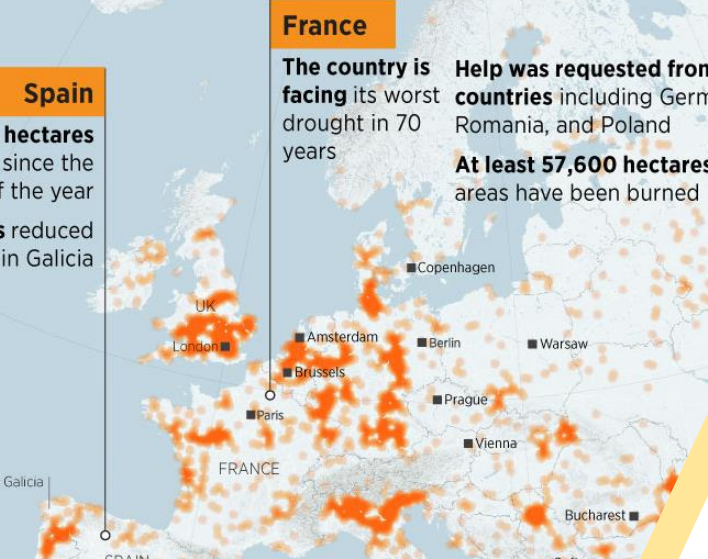


## France

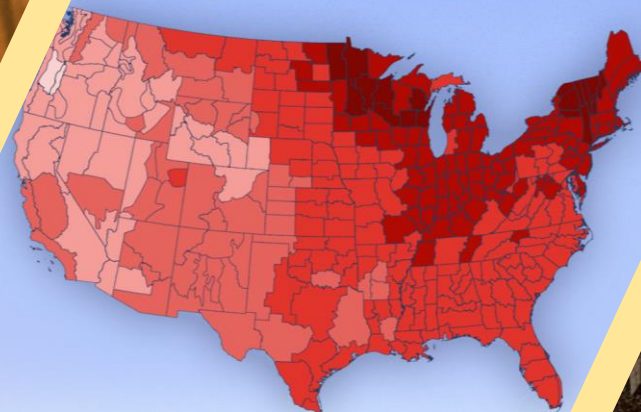
The country is facing its worst drought in 70 years

Help was requested from various countries including Germany, Romania, and Poland

At least 57,600 hectares of green areas have been burned



## WINTER WARMING



Average winter temperature (Dec-Feb).  
Source: NOAA/NCEI Climate at a Glance

CLIMATE







## Explore ▾

### LATEST

### MOST VIEWED

#### NEWS IN BRIEF

A third of the population can't see the Milky Way at night.

BY THOMAS SUMNER

JUNE 30, 2016

#### INTRODUCING

Scary tomato appears to bleed

BY SARAH SCHWARTZ

JUNE 30, 2016

#### SCIENCE TICKET

The 'super' El Niño is over, but La Niña looms

BY THOMAS SUMNER

JUNE 09, 2016

#### 50 YEARS AGO

Kids' anxieties, depression need attention

BY BRUCE BOWER

JUNE 09, 2016

#### NEWS

Volcanic rocks help turn carbon emissions to stone — and fast

BY THOMAS SUMNER

JUNE 09, 2016

#### SOCIETY UPDATE

Society welcomes Regeneron as new sponsor of Science Talent Search

NEWS CLIMATE, ANIMALS, CONSERVATION

# Pollen becoming bee junk food as CO<sub>2</sub> rises

Greenhouse gas threatens nutrition for pollinators

BY SUSAN MILIUS 7:03PM, APRIL 12, 2016



JUNK FOOD: Researcher says that rising CO<sub>2</sub> levels turn pollen into a less nutritious food for bees.

# Cambios en la regla de oro, una fuente clave de nutrición para las abejas melíferas

Los crecientes niveles de dióxido de carbono en el medio ambiente parecen estar afectando los niveles de proteínas en el polen

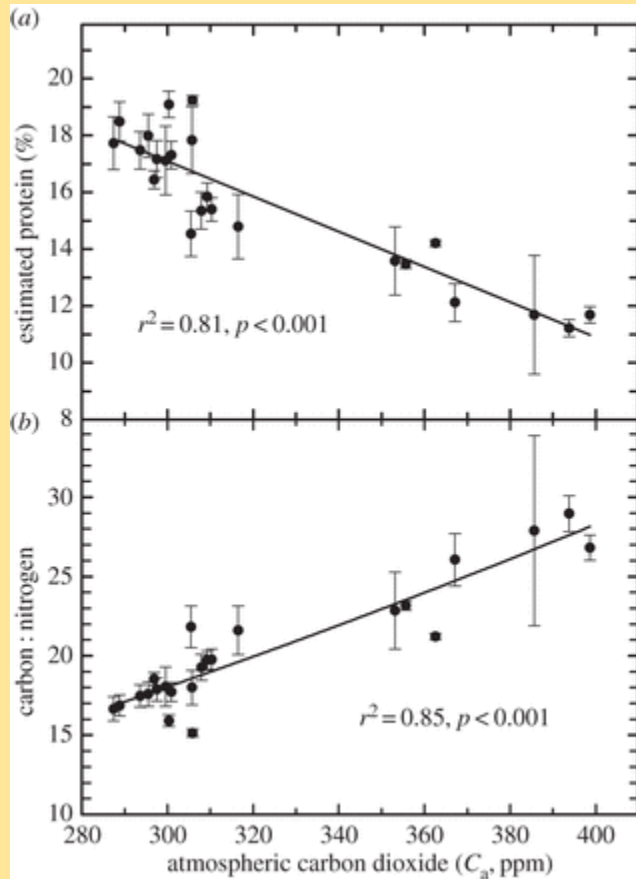
Lewis H. Ziska, USDA, Agricultural Research Service (ARS)

USDA Climate Hub, Beltsville, MD



# El aumento del CO<sub>2</sub> atmosférico está reduciendo la concentración de proteínas de una fuente de polen floral esencial para las abejas norteamericanas

Lewis H. Ziska, Jeffery S. Pettis, Joan Edwards, Jillian E. Hancock, Martha B. Tomecek, Andrew Clark, Jeffrey S. Dukes, Irakli Loladze, H. Wayne Polley  
Published 13 April 2016. DOI: 10.1098/rspb.2016.0414



Collected: 1876



1913



2002





# ¿Qué necesitan las abejas?

- Proteína – polen -> pan de abeja
- Carbohidratos – néctar -> miel
- Lípidos, vitaminas, minerales, propóleos – polen/recolección de alimentos
- Agua - pecoreo

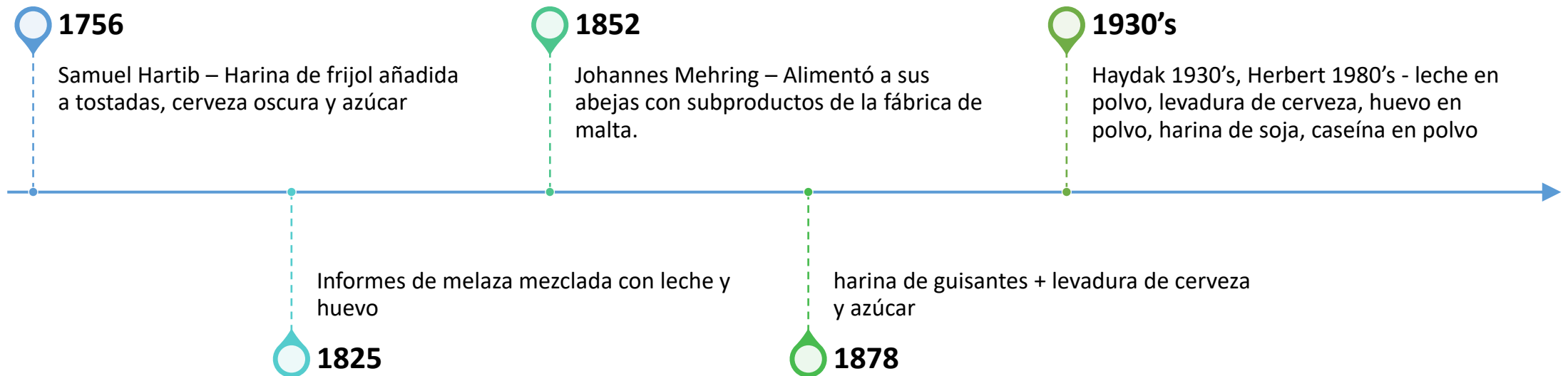
# ¿POR QUÉ ALIMENTAR?

- Aumentar las abejas de la caja: más abejas = más producción
- Para preparar colmenas para un gran flujo de néctar o un evento de polinización
- Para sostener el desarrollo de la colonia durante una estación seca o de escasez
- Aumentar las poblaciones para la división de colonias.
- Para reconstruir después de la exposición a pesticidas o una fuerte infestación de varroa.
- Continuar la producción de cría durante las inclemencias del tiempo.
- Para permitir que la colmena almacene más en lugar de consumir
- Anticiparse al invierno: aumentar las reservas de grasa y vitelogenina.





# Historia de la suplementación proteica en las abejas.



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<b>Amino acid</b>	<b>Ideal ratio from de Groot (g per 16g N)</b>
Threonine	3
Valine	4
Methionine	1.5
Leucine	4.5
Iso-leucine	4
Phenylalanine	2.5
Lysine	3
Histidine	1.5
Arginine	3
Tryptophan	1

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# Factores Antinutricionales (ANFs)

- Harina de soja: puede ser tóxica y retrasa a las abejas
  - Inhibidores de tripsina: bloquean la capacidad de las abejas para procesar proteínas.
  - Dos tipos de azúcar: estaquiosa y rafinosa que han mostrado toxicidad en insectos
- Proteína de huevo – ineficaz; bloquea una clave para el desarrollo muscular
  - La albúmina (blanca) contiene avidina (glicoproteína)
  - La avidina se une a la biotina, dejándola inútil.
  - La biotina juega un papel vital en la síntesis de proteínas, el desarrollo muscular, etc.

Hay otros, pero éstos están aprox. 90% de los productos comerciales... ¿por qué los utilizan?

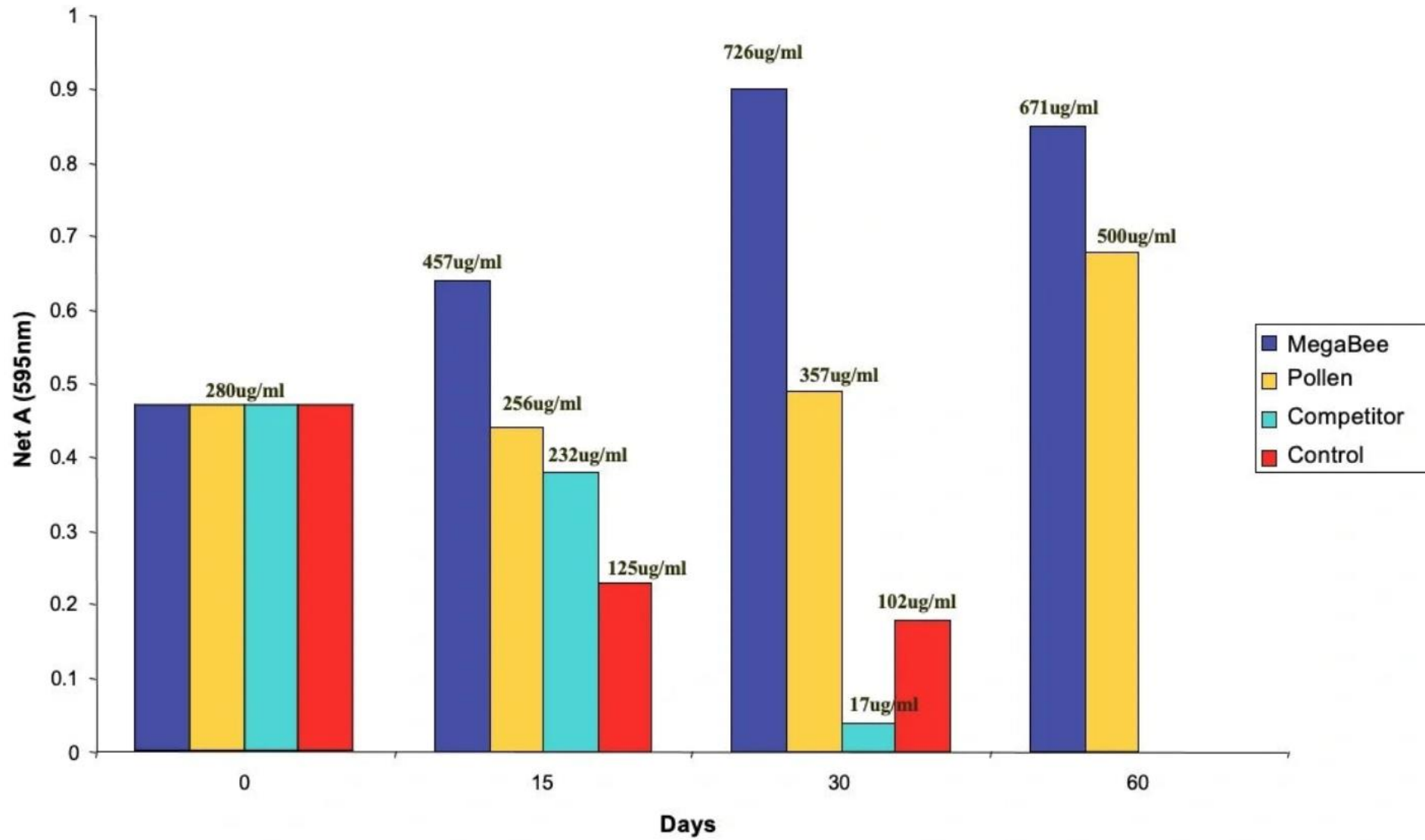
¿Comprar un producto proteico  
que bloquee la ingesta de  
proteínas?

¿Por qué?

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# Lista de deseos para una mejor alimentación

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Tamaño de partícula más pequeño -> aumentar la absorción nutricional

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Manténgase alejado de los Factores Antinutricionales

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Alto en proteína

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Perfil AA equilibrado

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pH equilibrado = intestino ácido

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Versatilidad: torta, candy, líquido, polvo.

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Necesita tener buen sabor, muy apetecible.



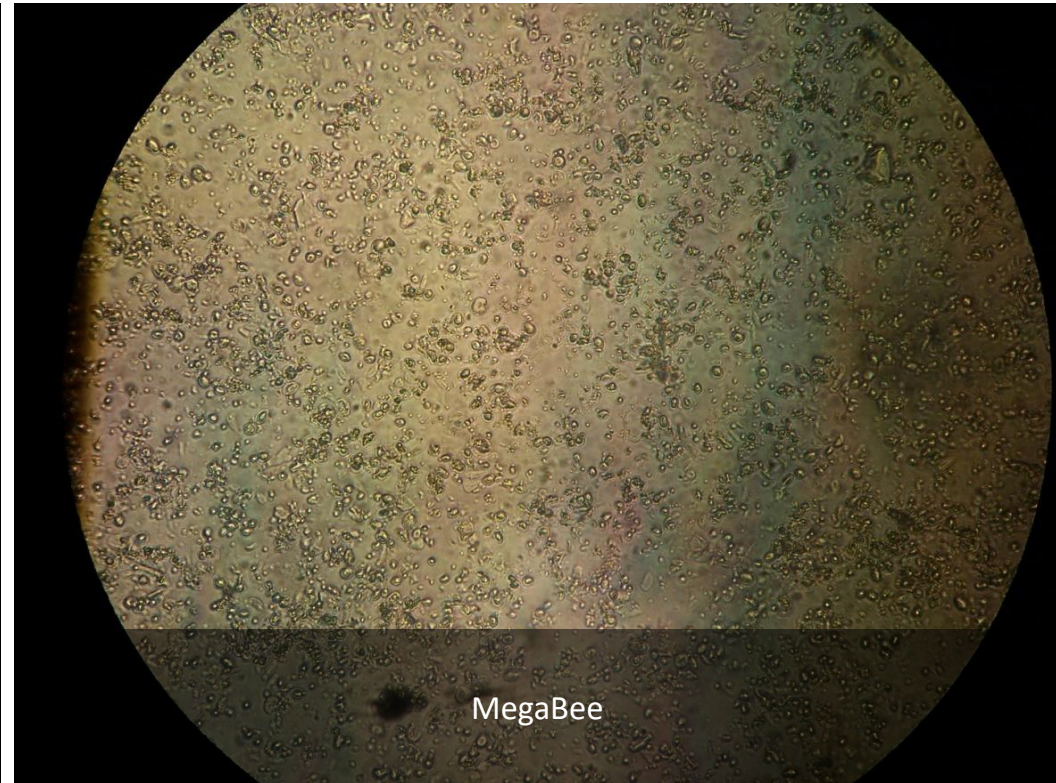
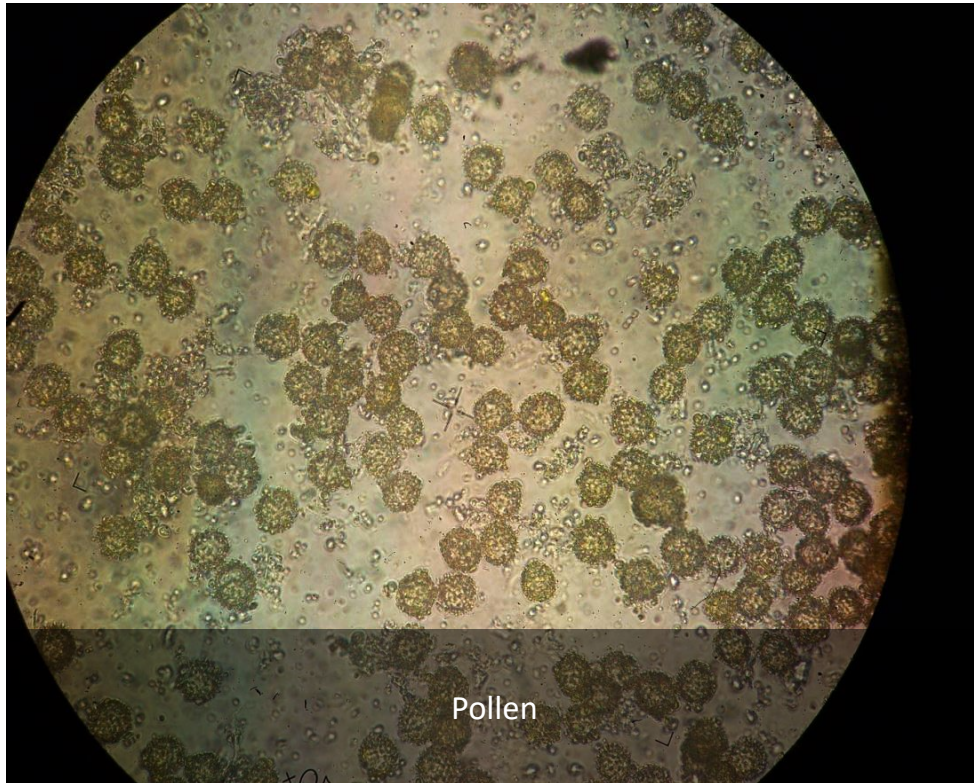
2001



2006



# Importancia del tamaño de las partículas

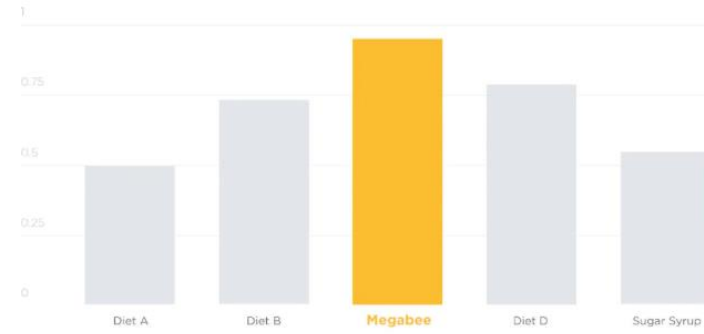


### Consumption vs. Other Products



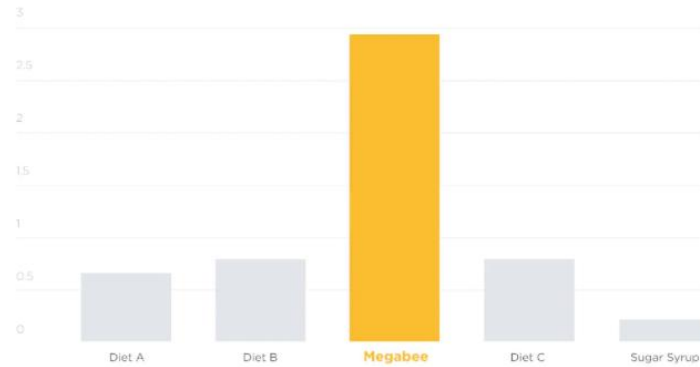
MegaBee was consumed as well as any of the other products tested.

### Increase of Adult Population:



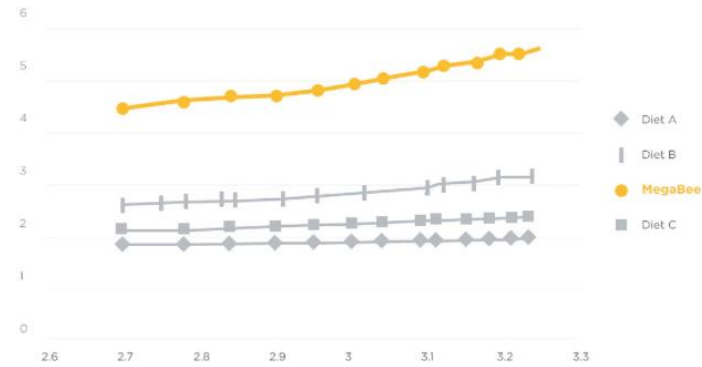
MegaBee increased adult populations 30% better than sugar syrup alone.

### Brood Increase



MegaBee tripled brood production and was 4x as effective as competing products.

### Food to Brood Comparison



With the same amount of food consumed, MegaBee was able to convert 75% more food into brood than the competitors



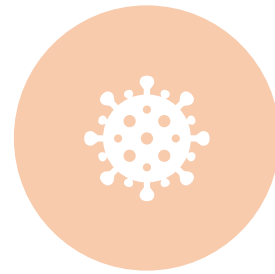
# Las Cuatro P's



PESTICIDAS



PARÁSITOS



PATÓGENOS

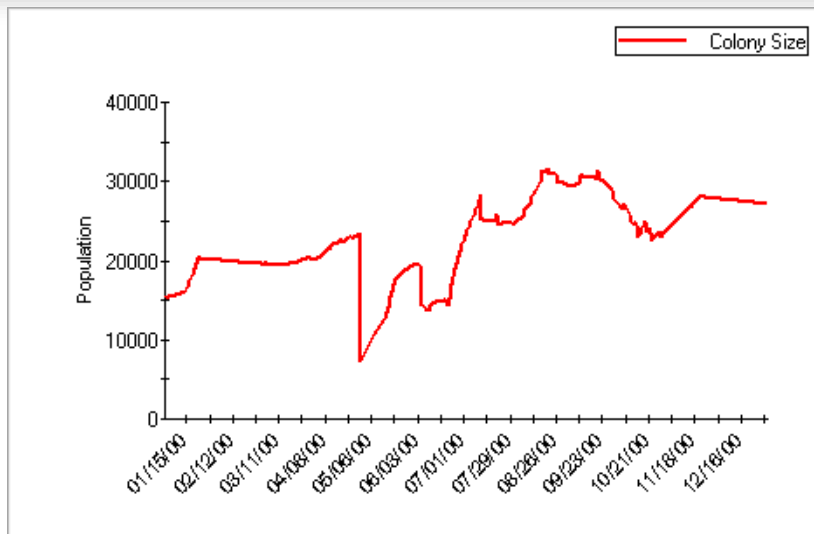


PASTO POBRE

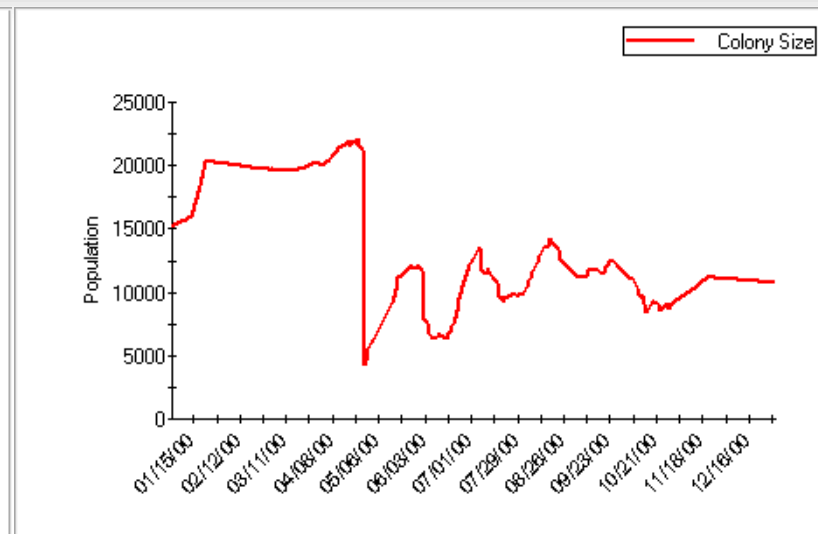
\* Todos estos pueden disminuir la vida útil de la abeja.



# ¿Qué diferencia pueden hacer 4 días?



Workers live for 35 days  
(21 days in the hive 14 days foraging)



Workers live for 31 days  
(17 days in the hive 14 days foraging)

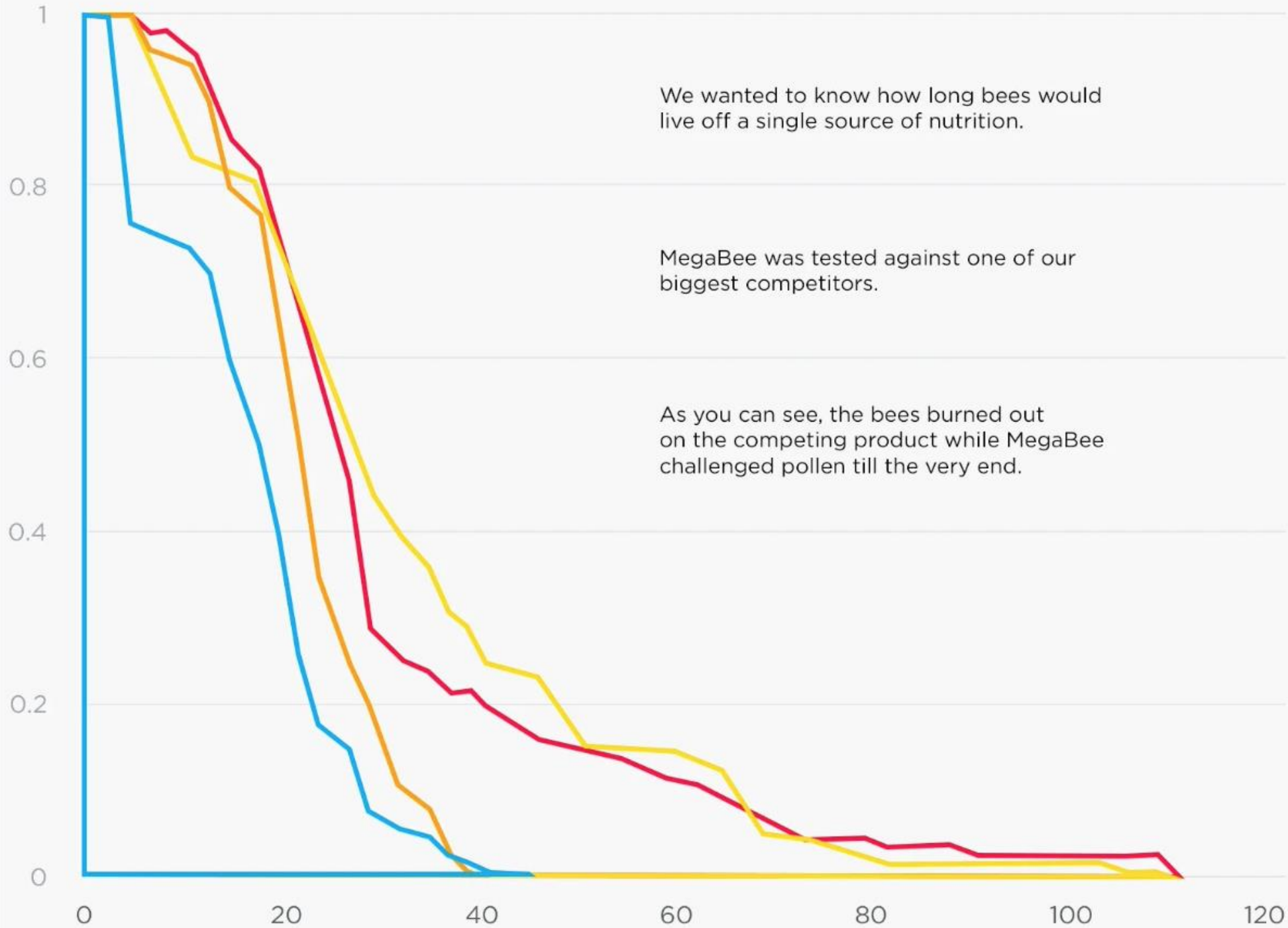
Simulation results from the VARROAPOP Model



We wanted to know how long bees would live off a single source of nutrition.

MegaBee was tested against one of our biggest competitors.

As you can see, the bees burned out on the competing product while MegaBee challenged pollen till the very end.



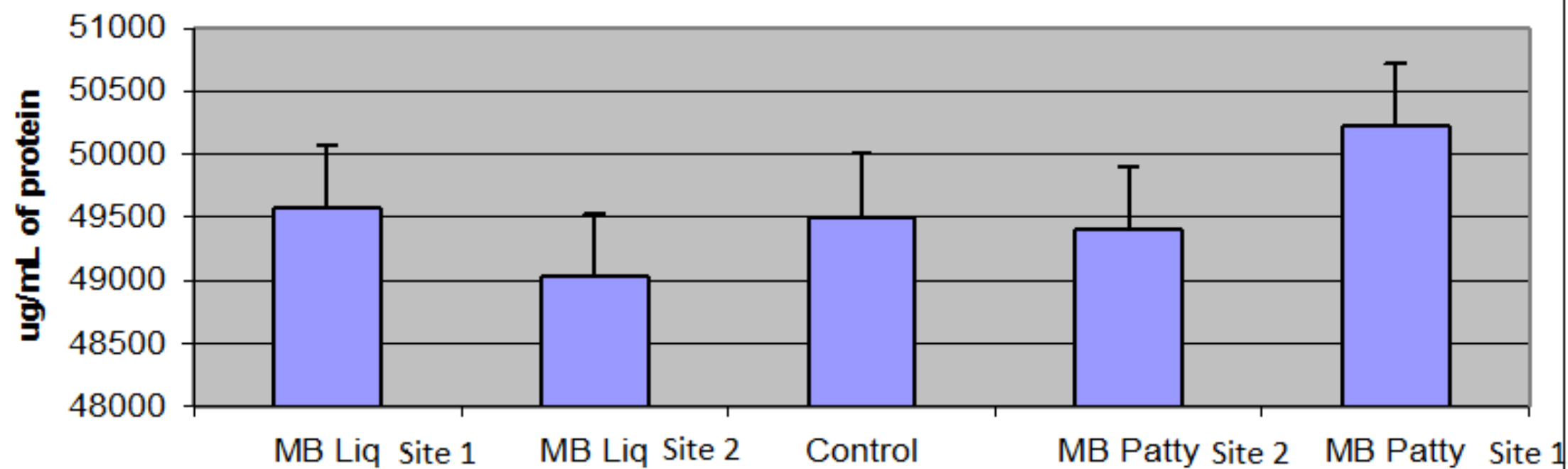
- Competitor
- Control
- Megabee**
- Pollen



# Niveles de proteína en abejas envejecidas



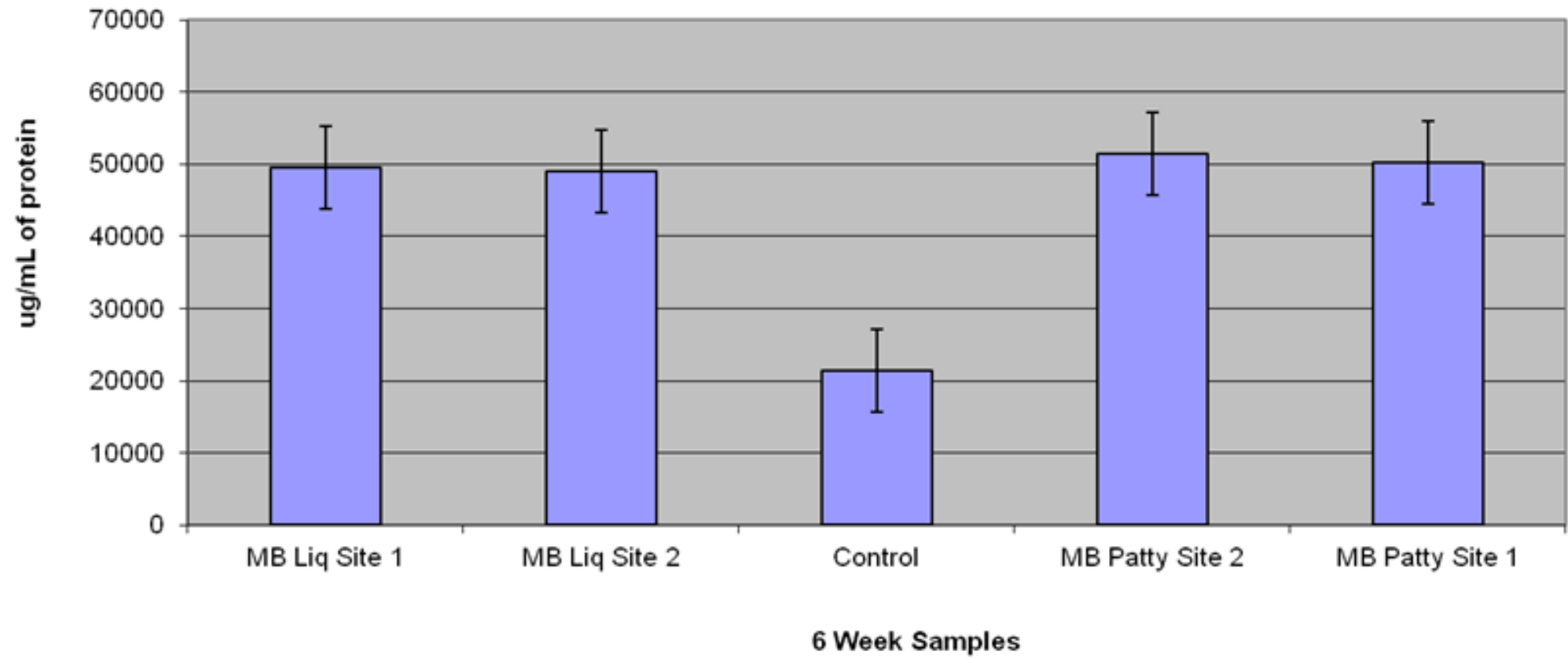
### Proteins in Samples



**3 WEEK SAMPLES**

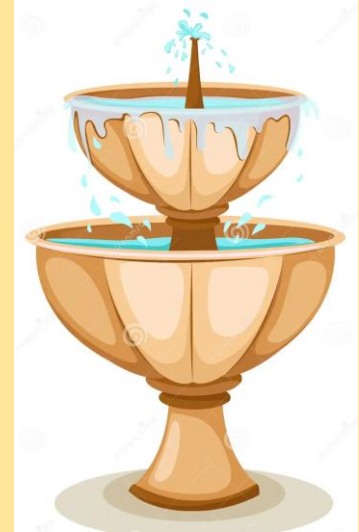


### Proteins in Samples



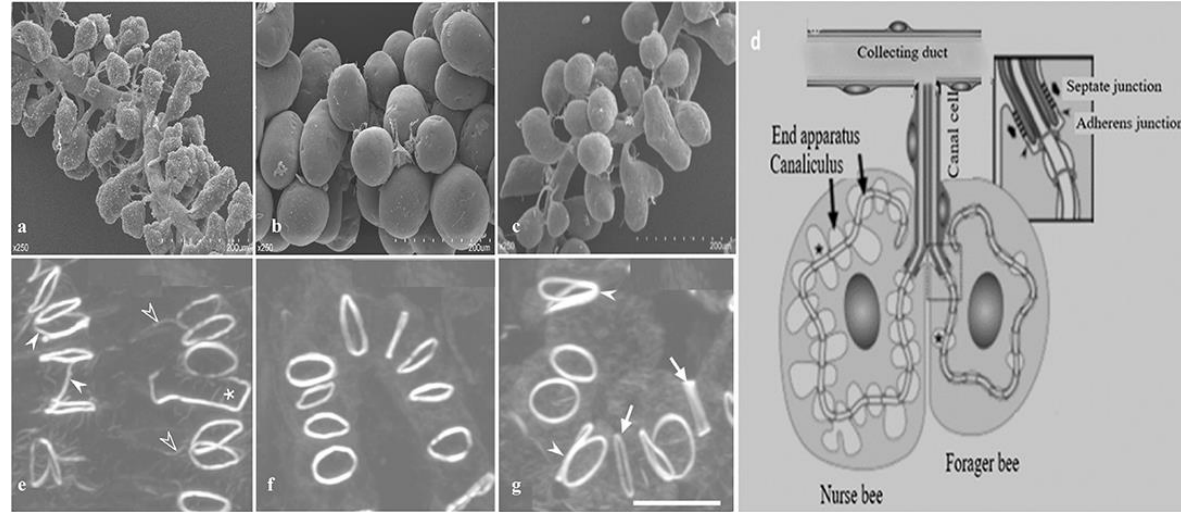
Proteína = longevidad, pero no toda  
la proteína en todos los momentos

Aproveche la “fuente de la juventud”  
de las abejas

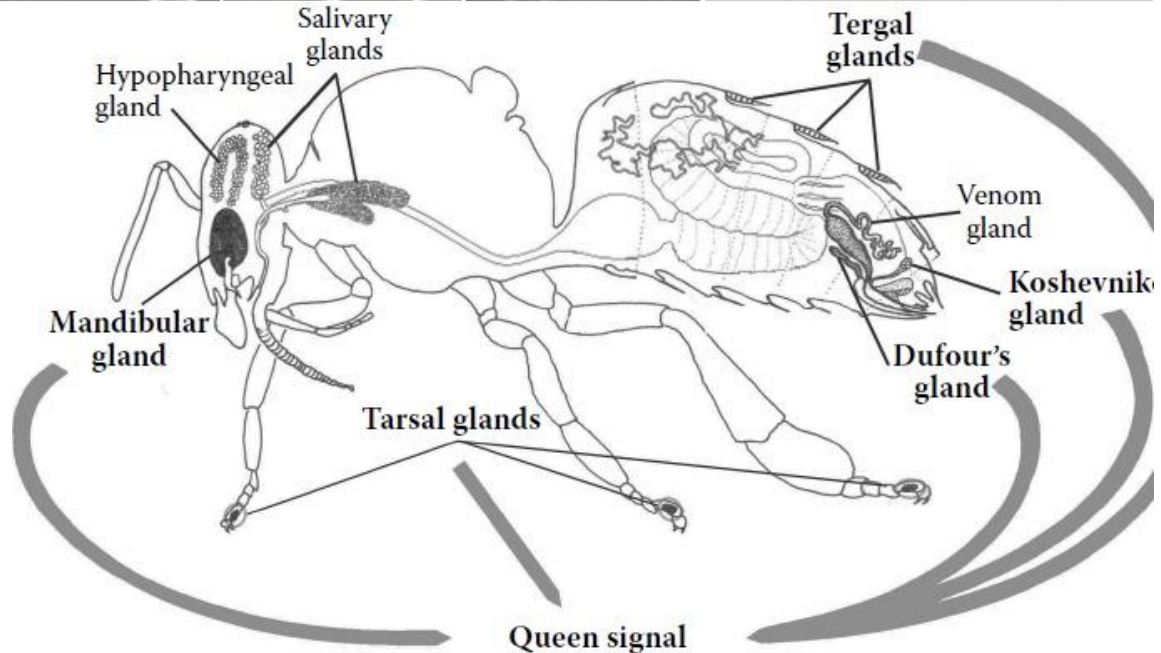


# Glándula hipofaríngea

- Órgano más importante
- Responsable de producción JR.
- El rendimiento alcanza su punto máximo entre 5 y 10 días
- Luego se marchita lentamente.



© Adam Tofilski - [www.honeybee.drawing.org](http://www.honeybee.drawing.org)



WEEK 1

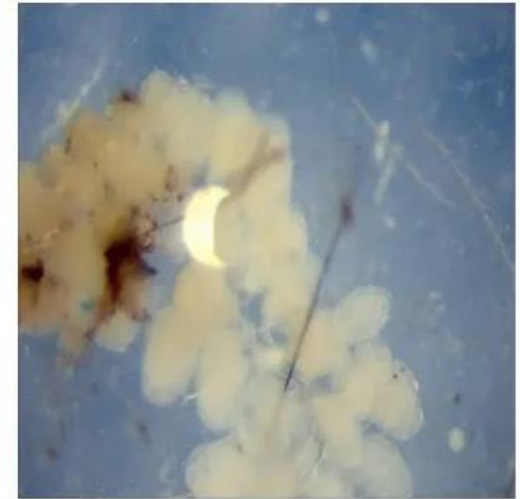
## The early stages

By the end of the first week these glands are now fully developed. Bees at this stage are nurses, busy feeding immature bees and learning their way around the hive.

What we are looking for in these images are nice round, plump glands (which all appear to have).



**Control**



**MegaBee**



**Competitor**

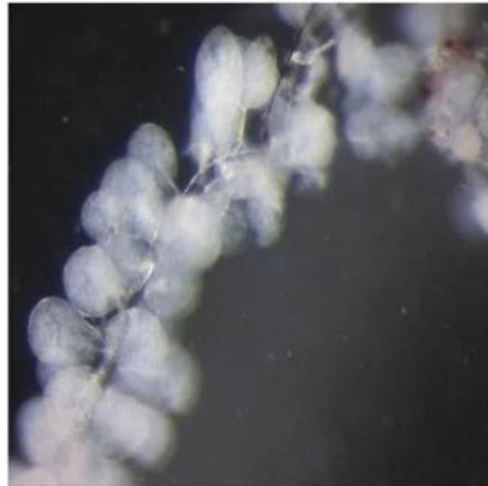


**Pollen**

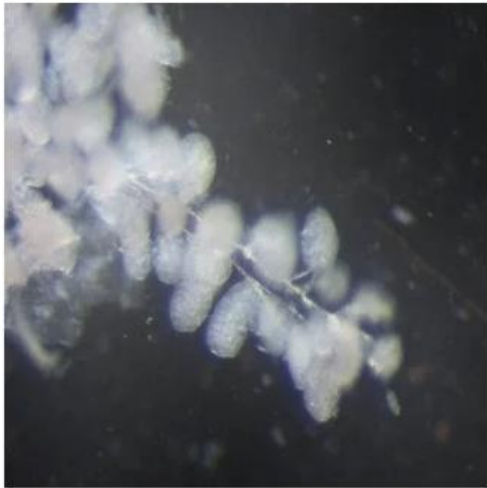




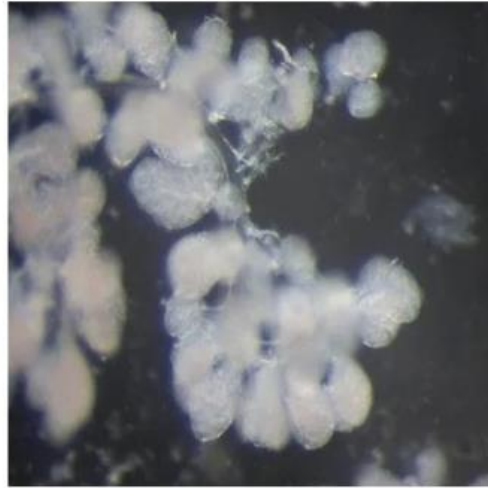
**Control**



**MegaBee**



**Competitor**



**Pollen**

WEEK 2

## The transition

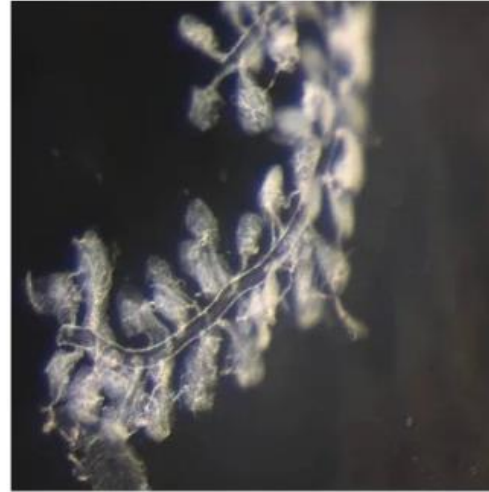
By the end of the second week most workers start to transition from nursing to other roles in the hive. Here you can see some of the HP glands from the control group starting to shrink, indicating the window is closing for these bees to continue producing royal jelly.

WEEK 3

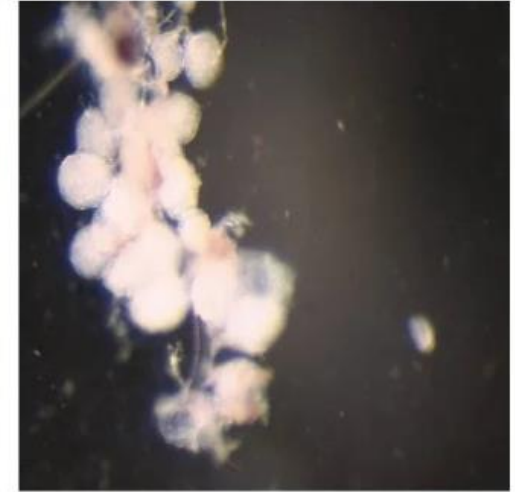
## The dropoff

By the end of week 3 things really start to come into focus. HP glands in the control and competitor groups are now rendered completely unviable (note how they look like shrivled raisins). Bees in these groups are well on their way towards roles as foragers.

The group fed pollen does appear to be showing some signs of degradation in their HP glands, and the MegaBee group appears to still be producing royal jelly...on to week 4.



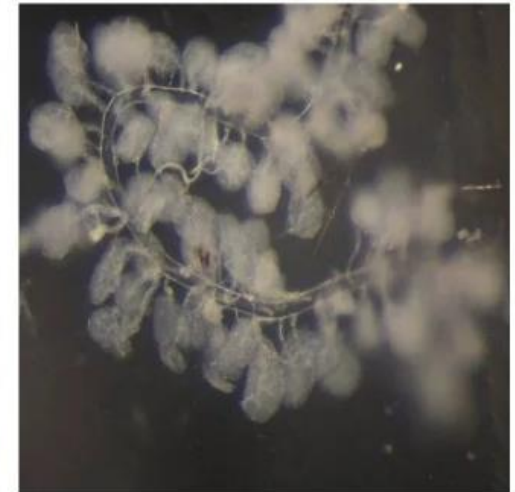
**Control**



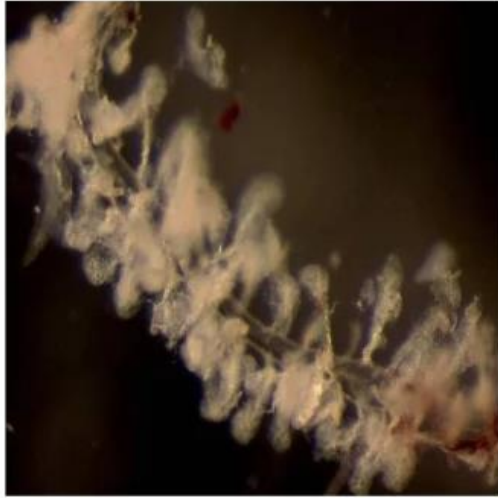
**MegaBee**



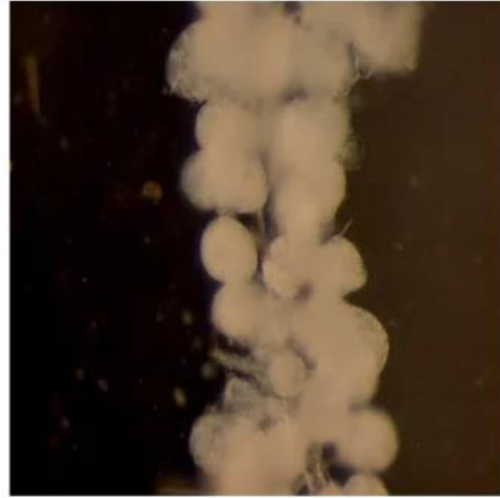
**Competitor**



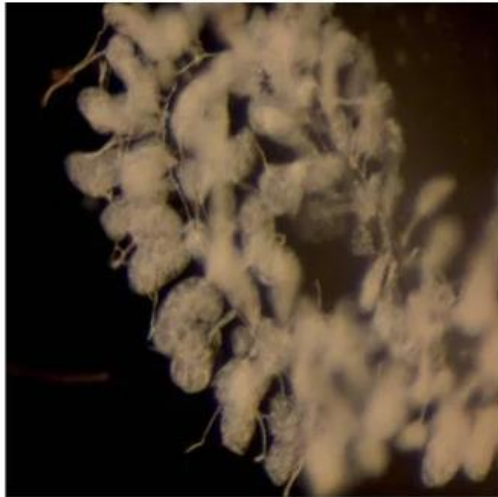
**Pollen**



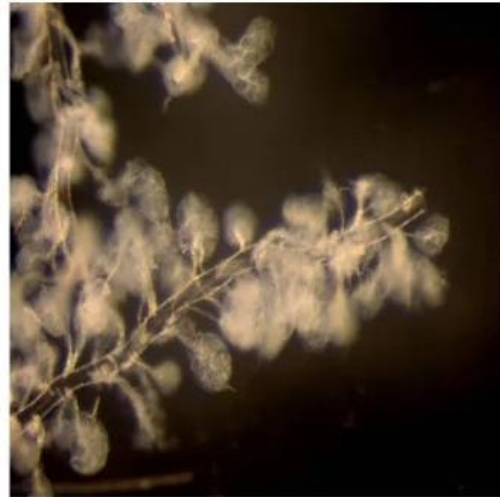
**Control**



**MegaBee**



**Competitor**



**Pollen**

WEEK 4

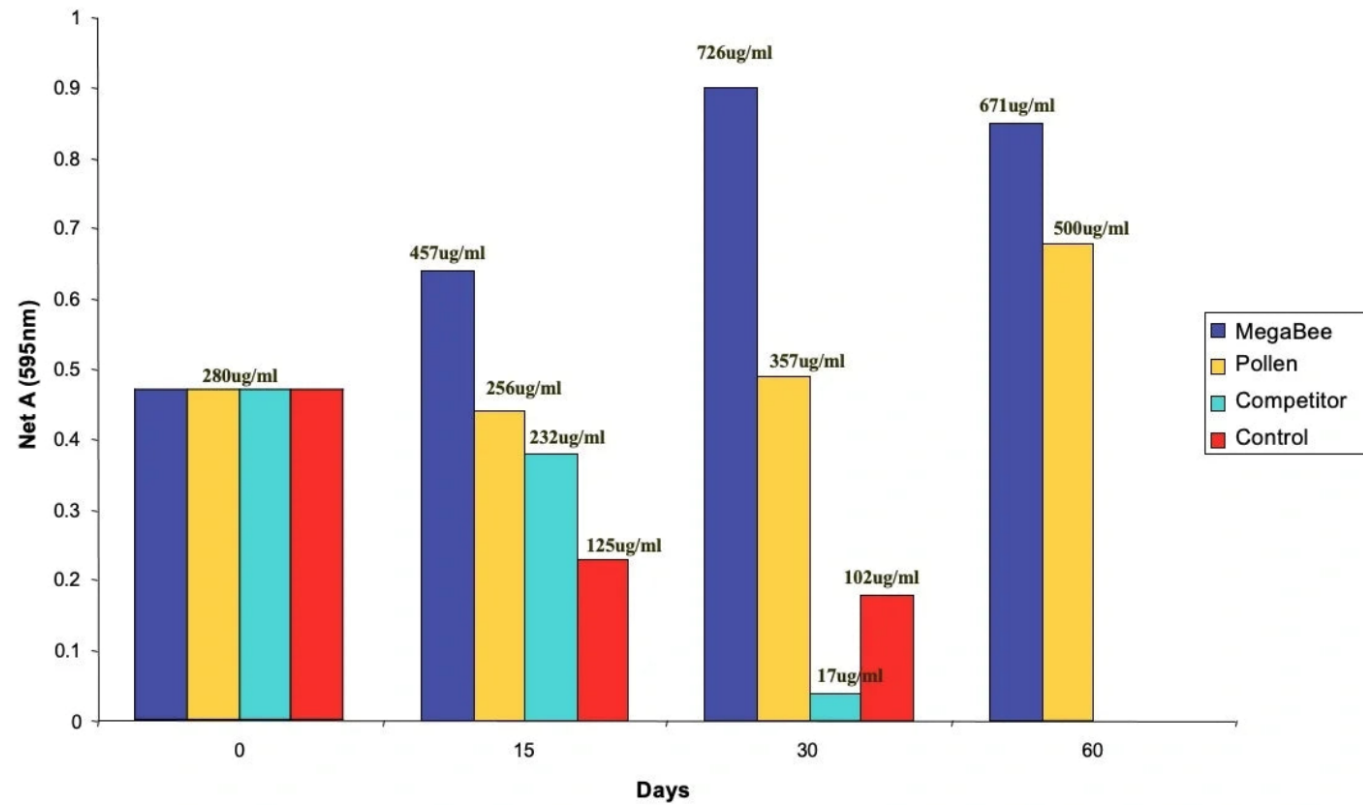
## The end

By this time, the only bees that appear to still show viable HP glands are the ones fed MegaBee. These bees four weeks in are still producing royal jelly, something largely unheard of.

Want to see how this looks in their blood? Check out the hemolymph tests done from this same study.

## Hemolymph Total Protein Concentration

In-vitro study - 100 newly emerged bees were monitored daily for mortality & sampled at regular intervals.  
Bees received each diet, sugar syrup and water ad-libitum.  
(we stopped the study after 60 days because all the control & competitors died)





# LA COLMENA

## una serie de generaciones superpuestas

### LOS ADULTOS VIVEN MENOS

- Los recolectores mueren temprano
- Esto obliga a las abejas a abandonar la colmena antes de que estén listas (menos efectivo, acorta la vida)
- Disminuye la proporción entre nodrizas y cría
- Esto crea una feromona de cría débil
- Cría subdesarrollada
- FIN



### LOS ADULTOS VIVEN MÁS

- Los recolectores viven más tiempo (++ prod.)
- Las abejas de la colmena llegan a desarrollarse adecuadamente
- Aumenta la proporción entre nodrizas y cría
- Cría nadando en jalea real
- Cría sana “aliméntame!!”
- Crea un exceso de JR
- Empiezan a compartir
- Proteína en abejas envejecidas ++
- Círculo completo



# QUEEN QUALITY REPORT

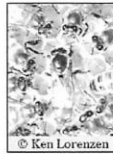


Report date: April 27, 2016

NC STATE UNIVERSITY  
APICULTURE PROGRAM

## Morphological measures

D-	Weight (mg)	Thorax width (mm)	Head width (mm)
Average	176.7	4.3	3.5
Maximum	216.8	4.62	3.74
Minimum	140	3.83	3.15
% GLOBAL	22.3%	13.8%	33.1%



## Pathogens and diseases

NA	Viruses									
	Nosema apis	Nosema ceranea	ABPV	BQCV	CBPV	DWV	TAPV	KBV	SBV	
% Positive (+)	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured
% Negative (-)	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured
% Low	NA	NA	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured
% Medium	NA	NA	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured
% High	NA	NA	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured

## Insemination success and mating number

C	% Viability	Sperm count (x10 <sup>6</sup> )	% filled
Average	74.8%	3.76	38.6%
Maximum	88.9%	5.80	54.3%
Minimum	37.5%	2.40	23.6%
% GLOBAL	29.7%	50.4%	50.3%

## OVERALL ASSESSMENT

**D+**

These queens appear to be below average reproductive quality

### Comments and recommendations

Large queens are an indication of strong and well-fed cell builders. These queens appear to have been raised in below average cell builders. These queens were not screened for any parasites or pathogens, so no conclusions or recommendations can be made concerning disease. The sperm stored in the spermathecae of these queens is of high viability, meaning that a sufficiently high percentage of the sperm was still alive at the time of processing. The total number of stored sperm is adequate.

# QUEEN QUALITY REPORT



Report date: April 27, 2016

NC STATE UNIVERSITY  
APICULTURE PROGRAM

## Morphological measures

A+	Weight (mg)	Thorax width (mm)	Head width (mm)
Average	216.6	4.7	3.7
Maximum	240.2	4.87	3.86
Minimum	189.5	4.43	3.49
% GLOBAL	79.6%	73.8%	69.9%



## Pathogens and diseases

NA	Viruses									
	Nosema apis	Nosema ceranea	ABPV	BQCV	CBPV	DWV	TAPV	KBV	SBV	
% Positive (+)	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured
% Negative (-)	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured
% Low	NA	NA	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured
% Medium	NA	NA	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured
% High	NA	NA	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured	Not measured

## Insemination success and mating number

B+	% Viability	Sperm count (x10 <sup>6</sup> )	% filled
Average	85.8%	5.74	63.0%
Maximum	93.2%	11.00	131.6%
Minimum	77.2%	3.07	31.5%
% GLOBAL	53.6%	78.3%	80.9%

## OVERALL ASSESSMENT

**A**

These queens are of high reproductive quality

### Comments and recommendations

Large queens are an indication of strong and well-fed cell builders. These queens appear to have been raised in very good cell builders. These queens were not screened for any parasites or pathogens, so no conclusions or recommendations can be made concerning disease. The sperm stored in the spermathecae of these queens is of high viability, meaning that a sufficiently high percentage of the sperm was still alive at the time of processing. The total number of stored sperm is very high.



## Interacciones nosema/proteína

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Un ensayo de investigación para examinar la interacción entre la proteína disponible y *Nosema*

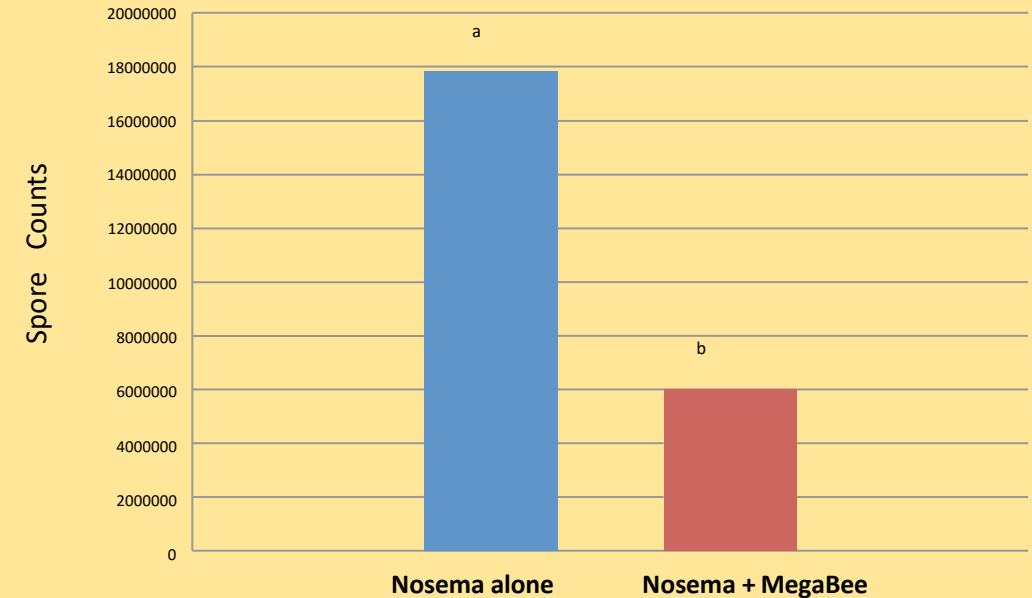
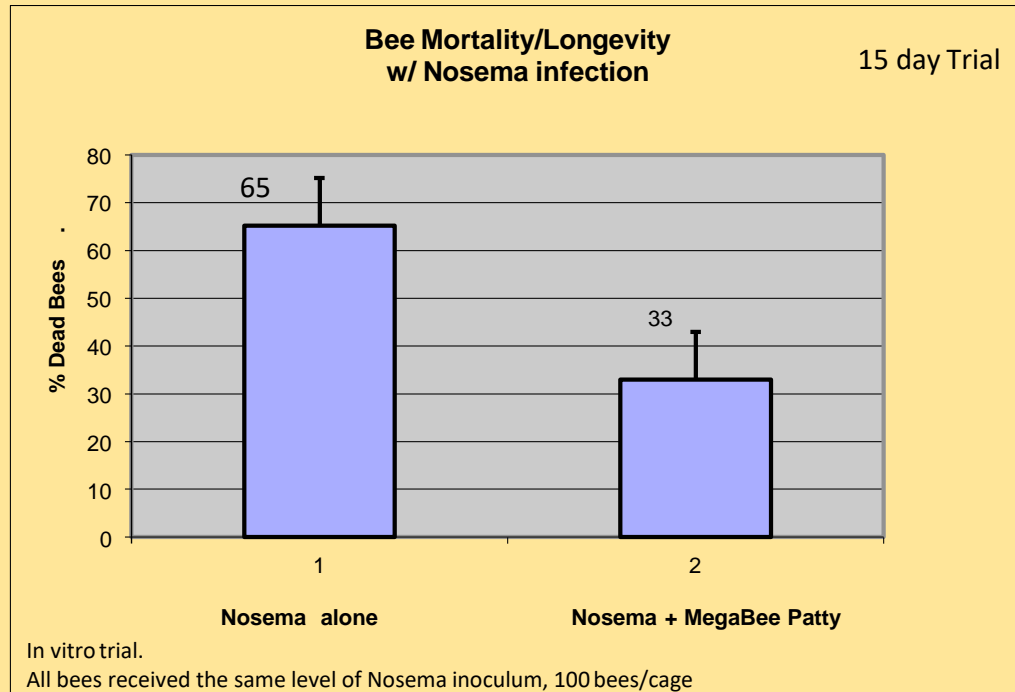
- Prueba *in vitro*
- 100 obreras recién nacidas por jaula
- Inóculo = 250.000 esporas de *Nosema ceranae* en 25 ml de jarabe de azúcar
- Duración – 14 días
- Observaciones: Mortalidad, Recuento de esporas en supervivientes, Desarrollo de la glándula hipofaríngea, Niveles de proteínas corporales.
- Dieta aplicada antes, en el momento de la inoculación y después de la inoculación.





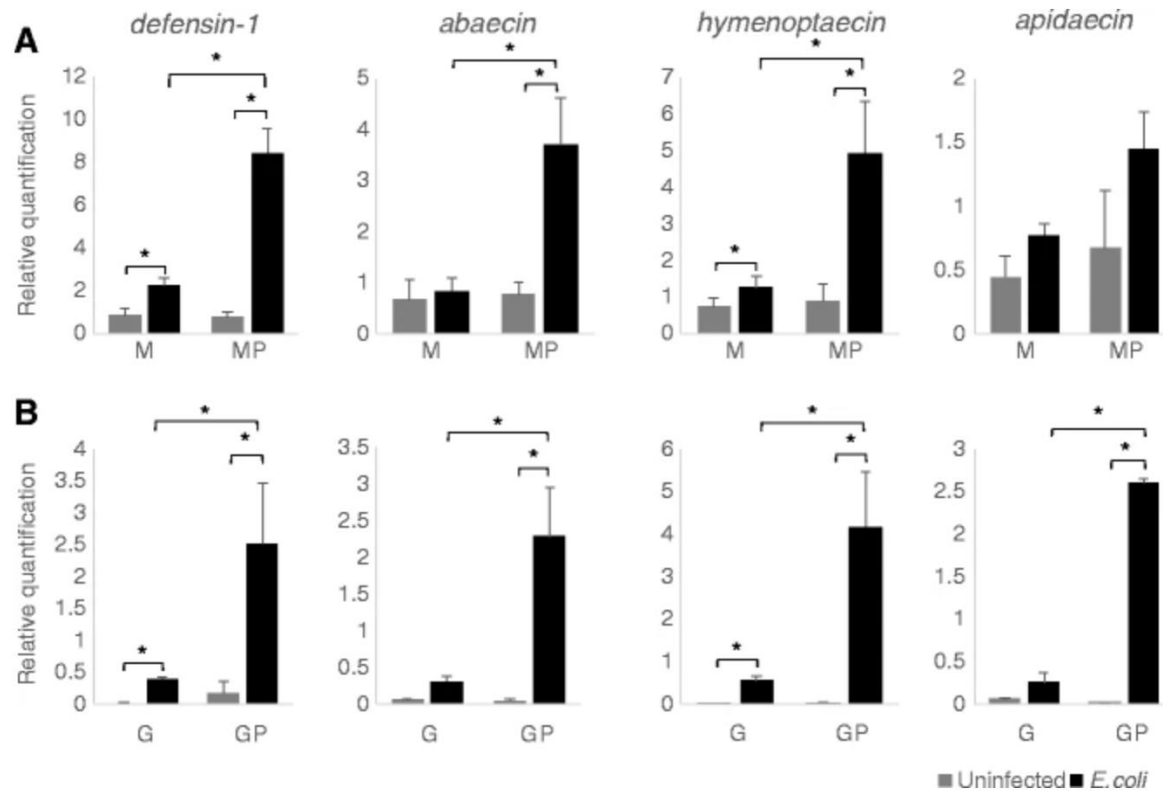
# Nosema / Interacciones proteicas

## Interacción de *Nosema ceranae* y MegaBee



All bees received the same level of Nosema inoculum – 2,500 spores/bee, 100 bees/cage. One treatment set received MegaBee one did not.  
Study conducted 2008, Tucson Arizona in Collaboration with the USDA Bee Research Center

# Estimular la respuesta inmune en las abejas



- Turcatto, A.P., Lourenço, A.P. & De Jong, D. Propolis consumption ramps up the immune response in honey bees infected with bacteria. *Apidologie* **49**, 287–296 (2018). <https://doi.org/10.1007/s13592-017-0553-z>



POLLINATION

**MEGABEE**<sup>®</sup>

SPRING BUILD-UP

SPLITTING & GROWTH

QUEEN REARING





# Consejos para programas de alimentación exitosos

- Sea proactivo, no reactivo
- No es necesaria la alimentación constante, sepa cuándo necesita alimentar. La alimentación es una herramienta!!!
- Considere un plan de alimentación de **6 semanas**, 2 ciclos de cría
- Coloca la nutrición lo más cerca posible de las nodrizas, ellas son las “cocineras”.
- La alimentación seca es menos efectiva que los métodos específicos dentro de la colmena.
- Recuerde: el alimento (o el polen) es solo el ingrediente. La nodrizas lo transforman en JR
- Busque indicadores que le muestren que está funcionando... no solo que la torta ha desaparecido!!.



PREGUNTAS?