OP-037 [Apitherapy]
Eurasian propolis and Brazilian green propolis compared: evaluation of chemical composition and comparison of cytokine release by PBMCs

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In this work, we aimed to study and compare the differences in the chemical composition of a dry extract of Euro-Asian poplar type propolis (PEA) and a dry extract of Brazilian green propolis (PVB), evaluating how these go to affect immunomodulatory activity, through in vitro tests.

Chemical analyses carried out by means of colorimetric tests and HPLC-DAD showed that PEA is characterised by a good polyphenolic presence, flavonoids in particular, among which pinocembrin, galangin and chrysin stand out, while PVB contains a good content of cinnamic derivatives, accompanied by the presence of pinobanksin, pinocembrin and artepillin C, its main and characteristic component.

For this reason, an ex vivo cell line such as PBMC was chosen, characterized by both the innate and adaptive part of the immune system. PBMC were treated with 25 µg/mL of the two different extracts. The results showed that, although both extracts have a strong cytokine modulation activity, this appears to be different in PEA and PVB: both have determined an up-regulation of the production of TNF-α and IL-1β to a different extent but, at the same time, PEA seems to act mainly on the innate component of the immune system while PVB on the adaptive one, as demonstrated by the strong production of IL-8 induced by PEA and of IL-2 by PVB.

These results highlighted that different propolis specifically possess distinct biological activities, emphasizing that a deeper understanding of their specific properties can aid in the development of targeted products and formulations useful in the context of health-related applications.

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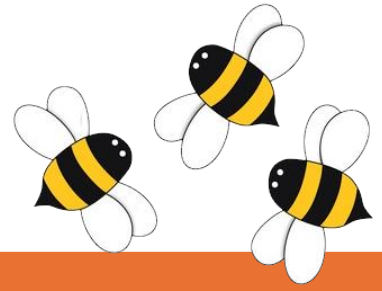

COLOR	GEOGRAPHICAL ORIGIN	MAIN PLANT ORIGIN
Brown/yellow	Europe/Asia	*Populus* spp.
Black	Central Northern Europe	*Betula verrucosa* Ehrh.
Green/brown	Brazil	*Baccharis dracunculifolia* DC.
Red/brown	South America	*Dalbergia ecastaphyllum* (L.) Taub.
Red	Venezuela and Cuba	*Clusia rosea* sp.

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Review article

How diverse is the chemistry and plant origin of Brazilian propolis?

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[1] Department of Botany, Institute of Biosciences, University of São Paulo, Rua do Matão 277, São Paulo, SP 05508-090, Brazil

Type	Biome	Chemical profile	Plant origin	References
Amazonian black	Amazonian forest	Polyisoprenylated benzophenones	*Clusia* sp.	Ishida et al. (2011)
Brown	*Araucaria* forest	Varied	*Araucaria*, *Populus*, other native and cultivated plant species	Koo et al. (1999); Adelman et al. (2007)
Dark	Atlantic Forest	Xanthones, steroids	*Symphonia globulifera*	Xavier et al. (2017)
Dark	"Campos rupestres"	Prenylated flavonols	Velloziaceae (?)	Righi et al. (2013)
Green	Cerrado	Prenylated phenylpropanoids, triterpenoids	*Baccharis dracunculifolia*, *Vernonia rubriramea*	Freire (2000); Salatino et al. (2005); Righi et al. (2013)
Green	Caatinga	Chalcones, flavonols	*Mimosa tenuiflora*	Ferreira et al. (2017)
Red	Mangrove	Chalcones, isoflavonoids, prenylated benzophenones	*Dalbergia ecastaphyllum*, *Symphonia globuliera*	Daugsch et al. (2008); Silva et al. (2008); Ccana-Ccapatina et al. (2020)
Yellow	Pantanal	Steroids, triterpenoids	Undetermined	Machado et al. (2016)

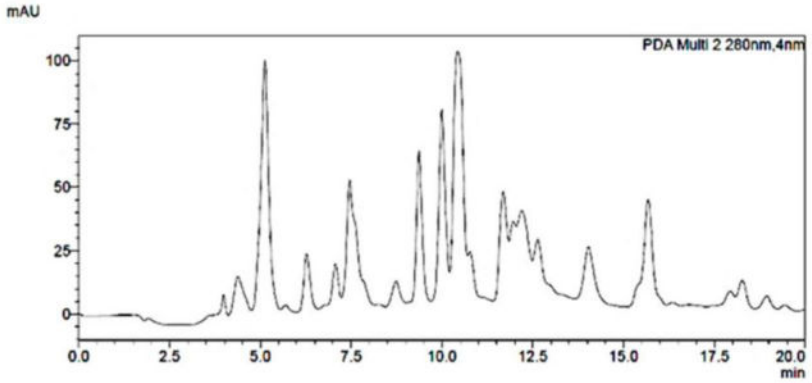
Plants (Basel). 2024 Sep 29;13(19):2734. doi: 10.3390/plants13192734.

Chemical Markers in Italian Propolis: Chrysin, Galangin and CAPE as Indicators of Geographic Origin

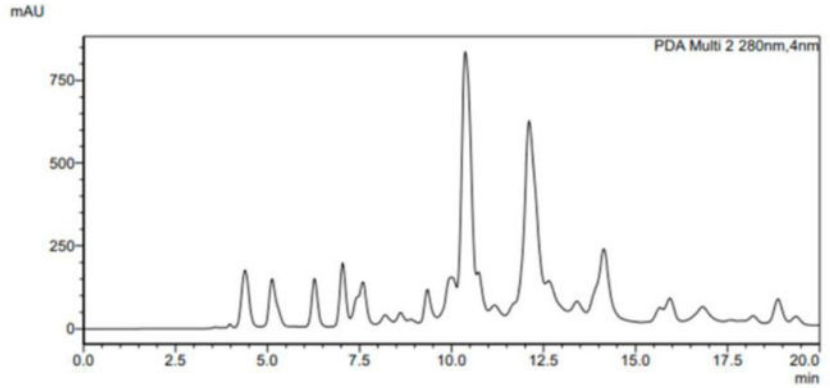
Elisabetta Miraldi [1], Giorgio Cappellucci [1 2], Giulia Baini [1 2], Elia Silvia Pistone [2], Marika Allodi [3], Gabriele Costantino [3], Chiara Spaggiari [3], Marco Biagi [2 3]

Affiliations + expand

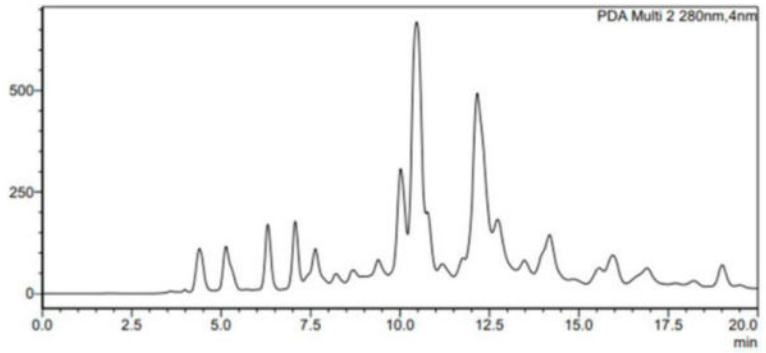
PMID: 39409604 PMCID: PMC11478685 DOI: 10.3390/plants13192734



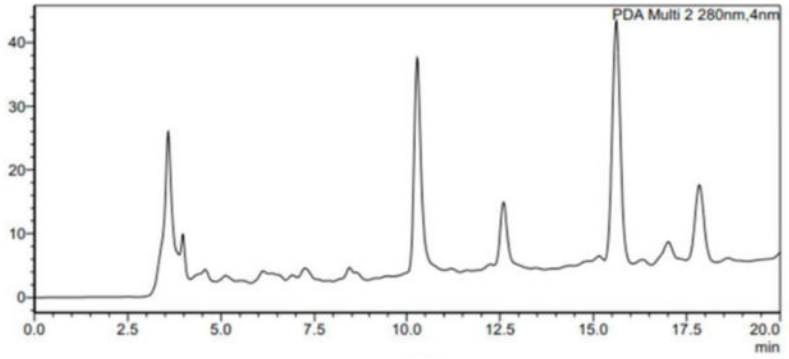
Piedmont



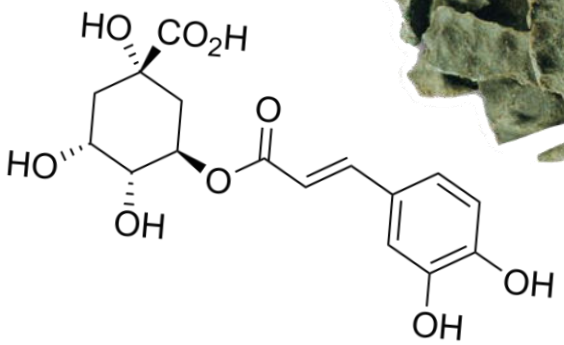
Umbria



Calabria



Sicily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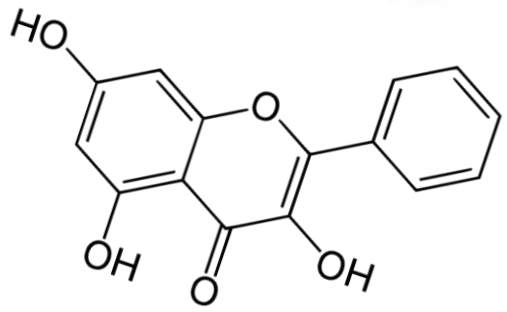
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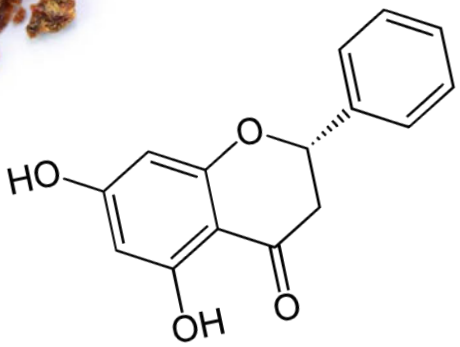
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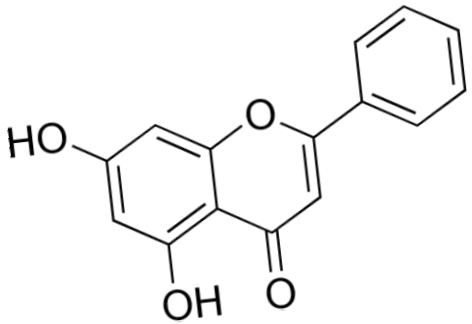
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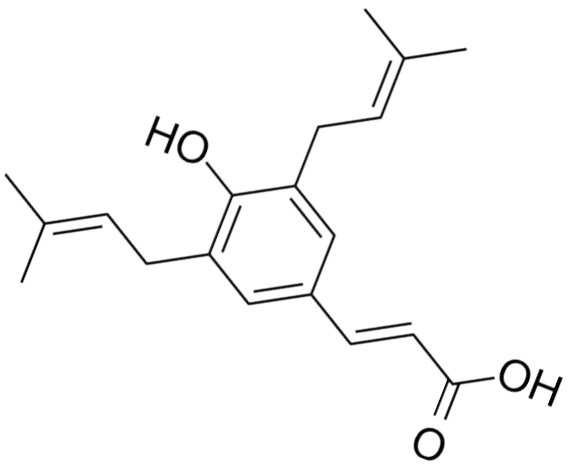
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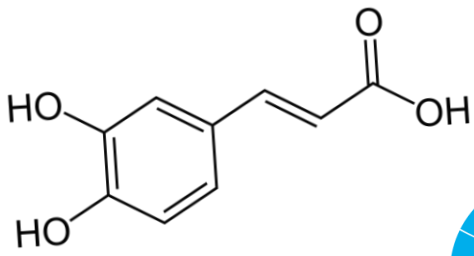
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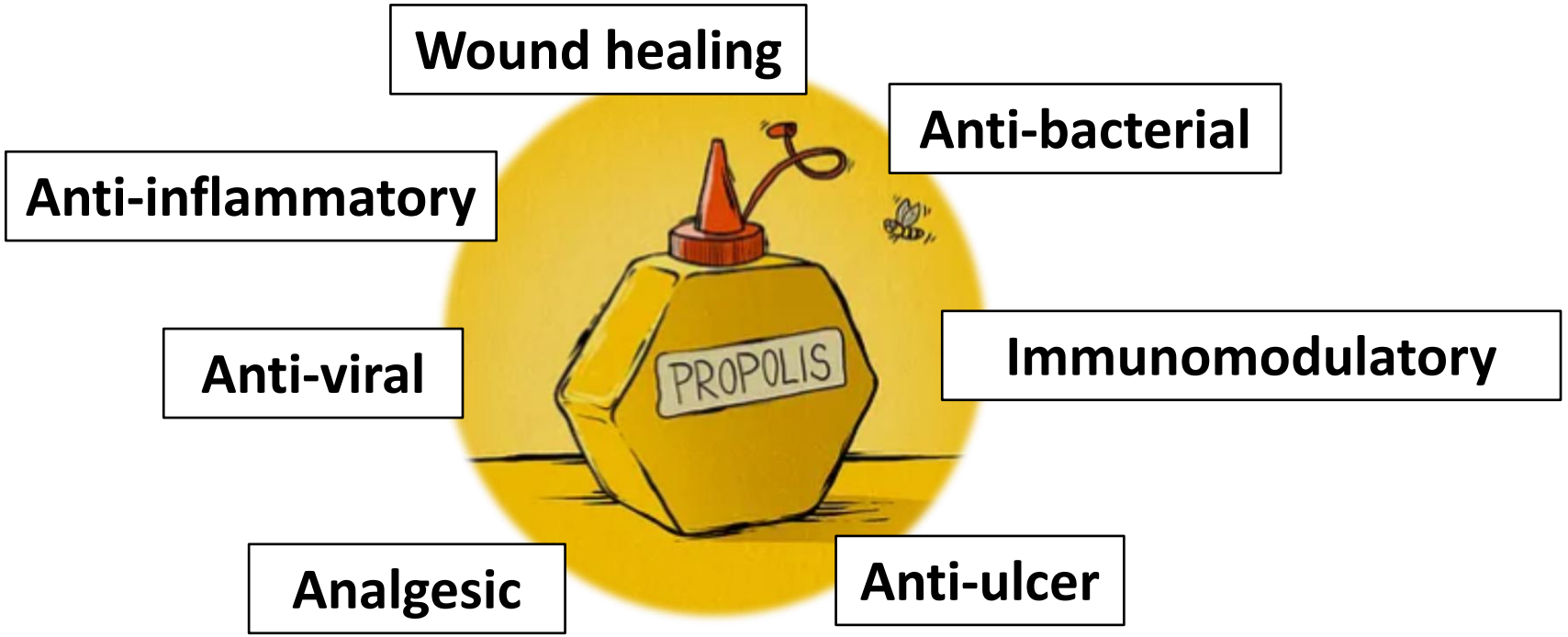
APIMONDIA

From prehistoric times, through ancient Egypt and Rome, to the present day, humans have used propolis to support and protect their health.

«The man of Bicorp» (about 8000 years ago)

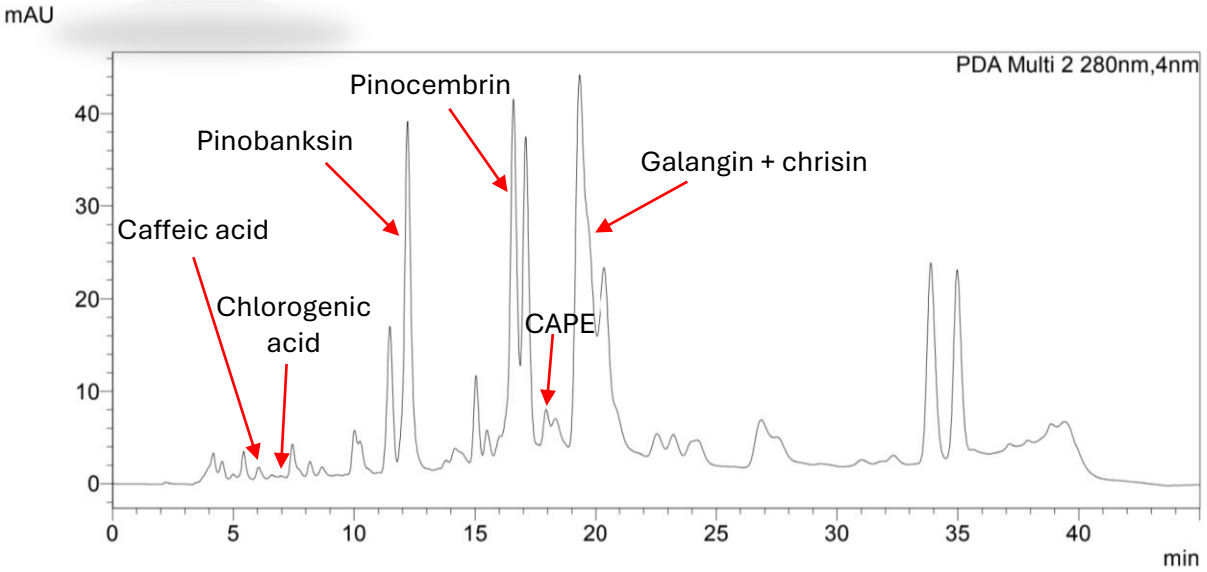


EtOH 75% (V/V)

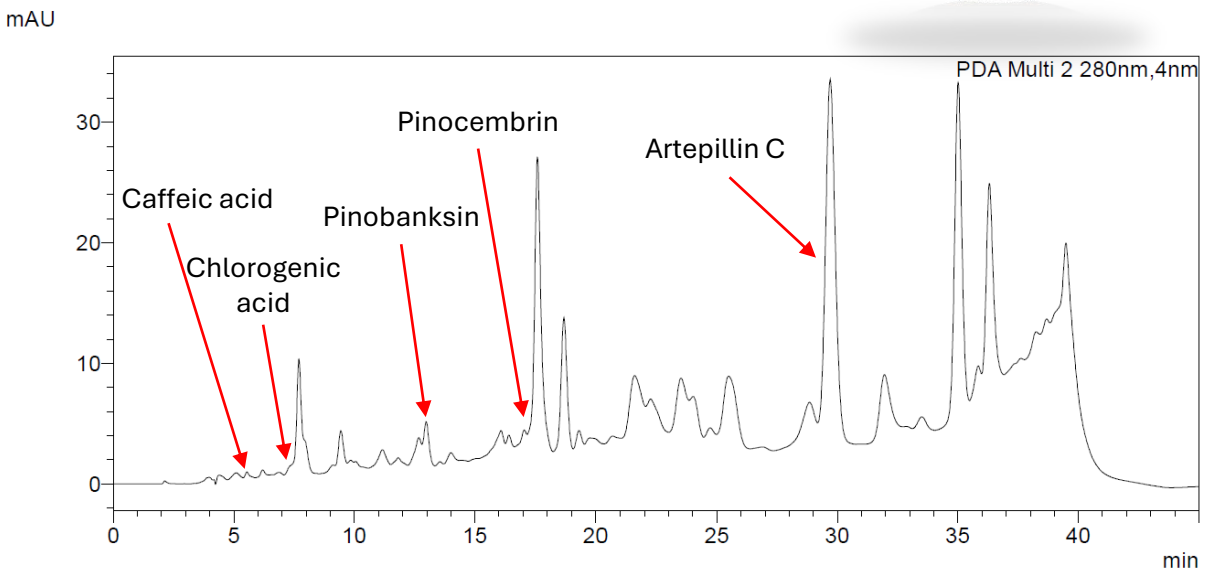
PEA

PVB

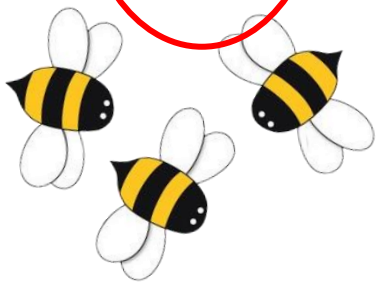
PEA



PVB



	PEA % (m/m)	PVB % (m/m)
Total polyphenols	7.43 ± 0.98	2.06 ± 0.30
Total flavonoids	6.05 ± 0.58	0.88 ± 0.16



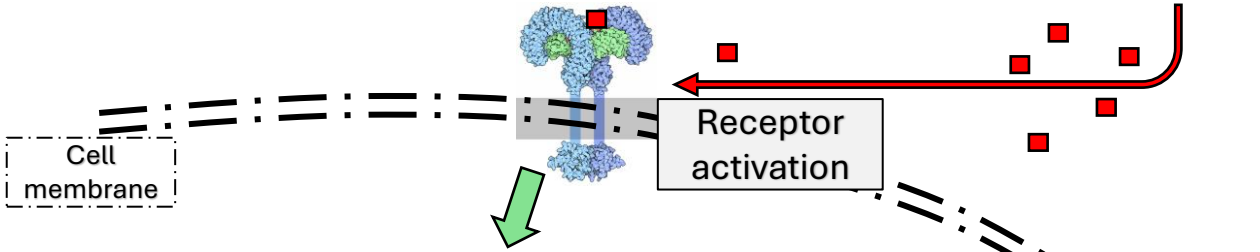
Compounds	PEA % (m/m)	PVB % (m/m)
Caffeic acid	0.02 ± 0.01	< 0.01
Chlorogenic acid	0.02 ± 0.01	< 0.01
Pinobanksin	1.08 ± 0.09	0.04 ± 0.01
Pinocembrin	1.01 ± 0.02	0.03 ± 0.01
CAPE	0.35 ± 0.08	-
Galangin + Chrysin	2.41 ± 0.12	-
Artepillin C	-	0.81 ± 0.06

IMMUNE SYSTEM

- **Innate** → **Monocytes**
- **Adaptive** → **Lymphocytes**

Toll Like Receptors

PAMPs e DAMPs



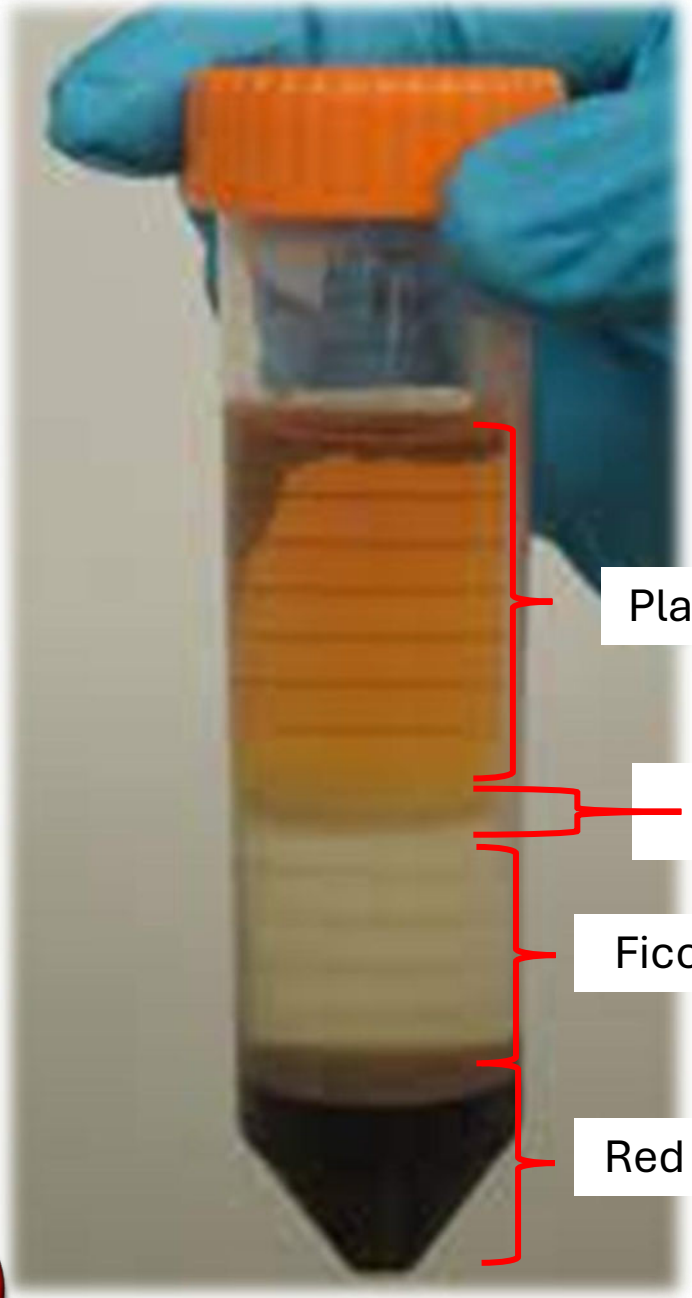
Signal transduction and transcription

Pathways

Release of cellular mediators

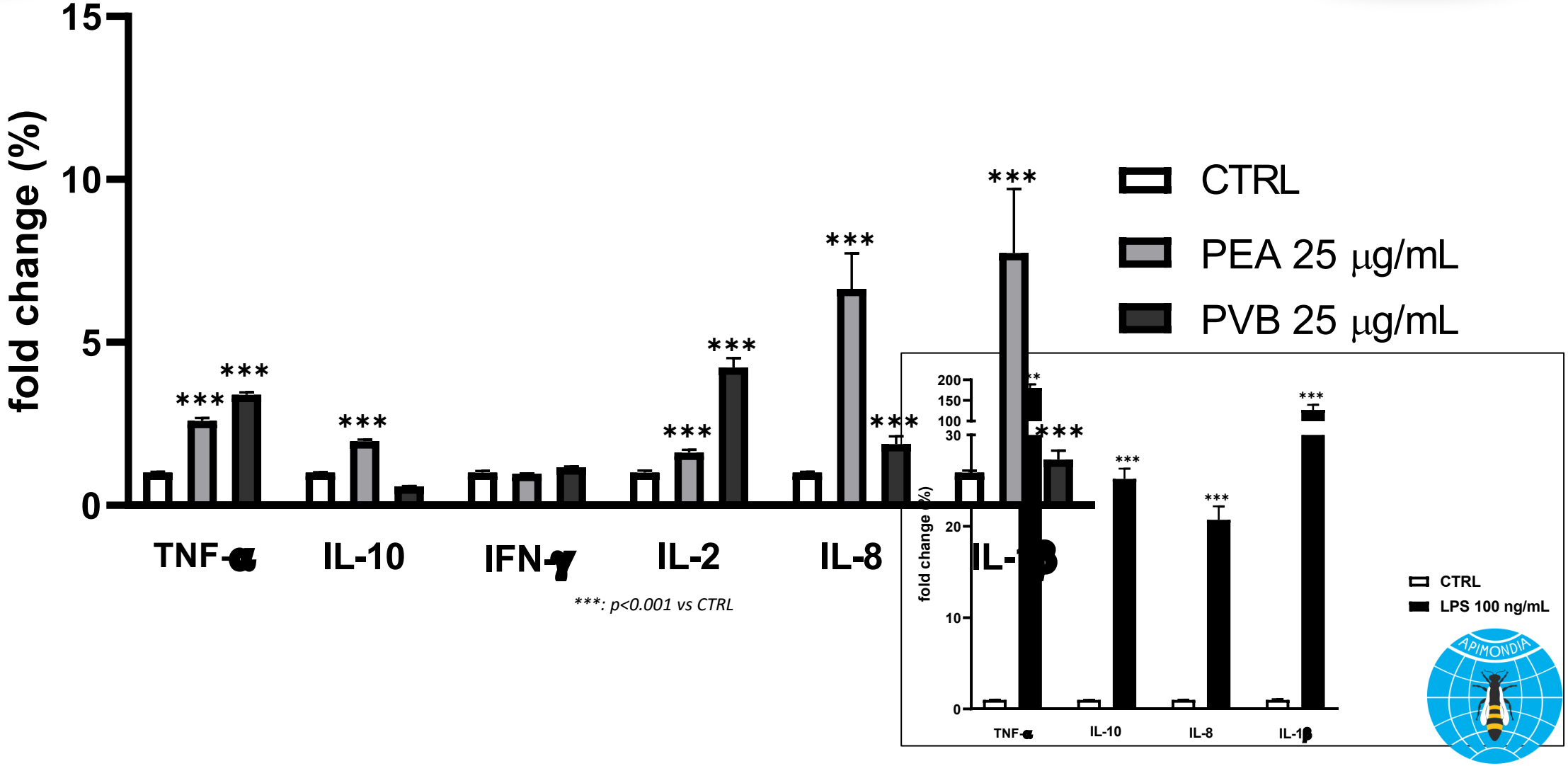
Cytokines

Nucleus



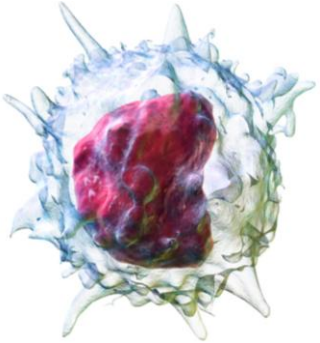
PEA

PVB


fold change (%)
15
10
5
0
***
TNF-α
IL-10
IFN-γ
IL-2
IL-8
IL-1β
CTRL
PEA 25 µg/mL
PVB 25 µg/mL
***: p<0.001 vs CTRL
200
150
100
30
20
10
0
CTRL
LPS 100 ng/mL
APIMONDIA

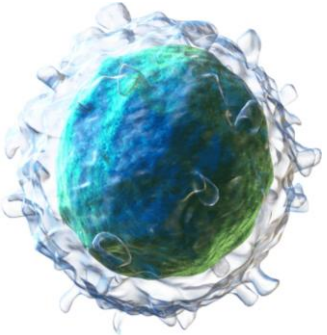
PEA

Innate immune system



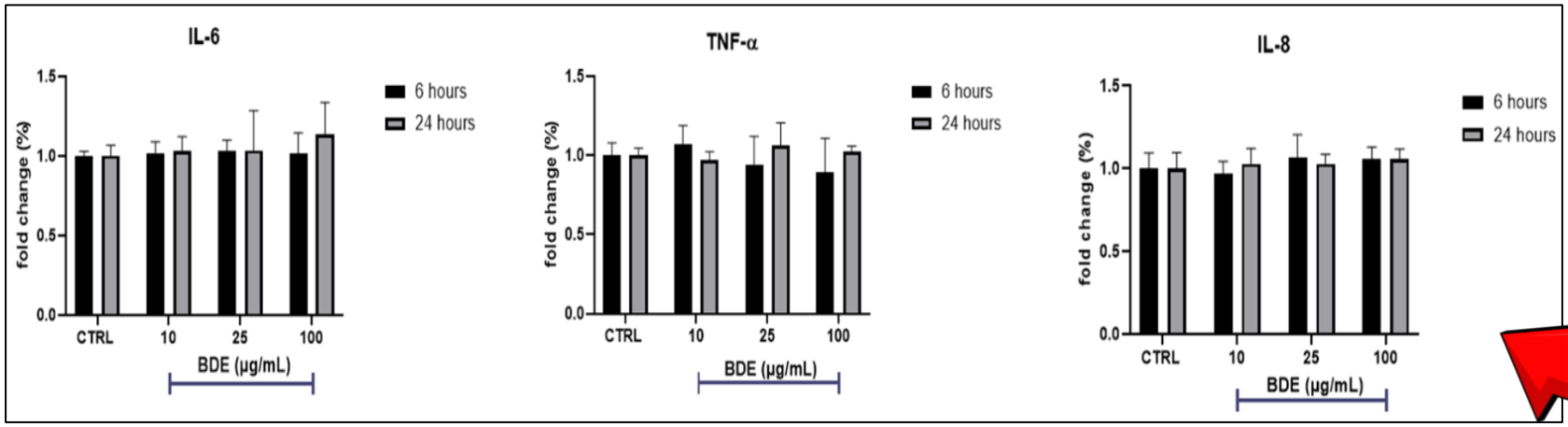
PVB

Adaptive immune system

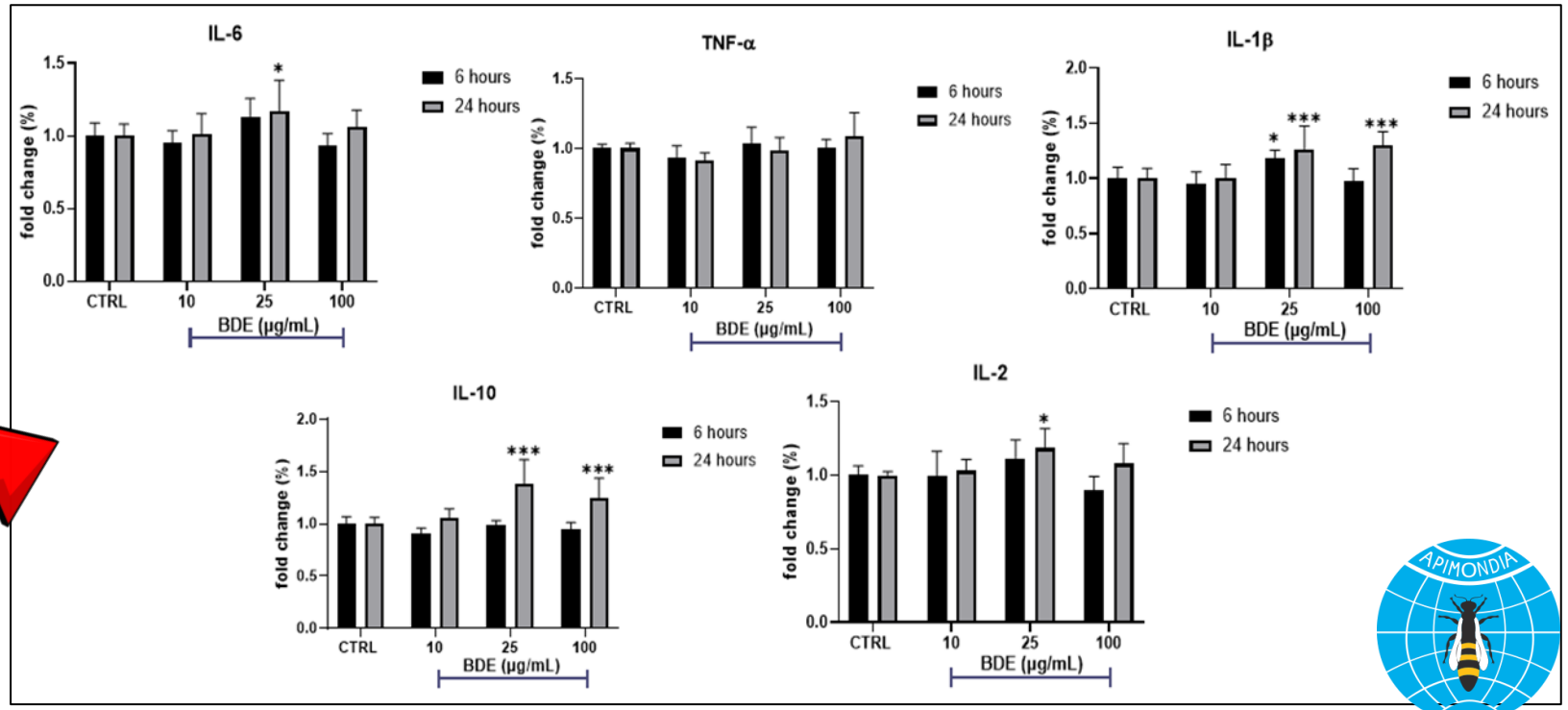


Baccharis dracunculifolia DC.

THP-1



PBMC



*: p<0.05 vs CTRL; ***: p<0.001 vs CTRL

Conclusions

- The **qualitative and quantitative differences** in the chemical composition of different types of propolis make it difficult to classify everything under the term “propolis,” but they also offer us the opportunity to **exploit this heterogeneity in different health issues**, with different mechanisms of action **even to achieve the same biological effect**.

- **Euro-Asian propolis (PEA)**: richer in **total flavonoids**, which make up almost the entire polyphenolic content, it seems to act purely on the **innate component of the immune system**.

- **Brazilian green propolis (PVB)**: richer in **total phenolic acids**, particularly cinnamic isoprenylates, it seems to have a greater influence on the **adaptive component of the immune system.**

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- **Dr. Giulia Baini**

Department of Food and Drug, University of Parma, Italy:

- **Prof. Marco Biagi**

Thank you for your attention

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