



Professor Colin McGuckin, CSO, CTIBIOTECH

Bioimpedance-connected and vascularized 3D bioprinted human skin chip for high throughput efficacy testing.



McGuckin, Colin^{1*}; Bechetoille, Nicolas²; Legues¹, Maxime; Milet, Clement¹; Besseyre, Raphael¹; Boyer, Maxime¹; Ferrier, Wendy¹; Sanchez, Alexia²; Forraz, Nico¹; Vogelgesang, Boris².

¹ CTIBIOTECH, Lyon, France; ² Gattefosse SAS, Saint-Priest Cedex, France

The team involved in the study, 2022

Lyon, France



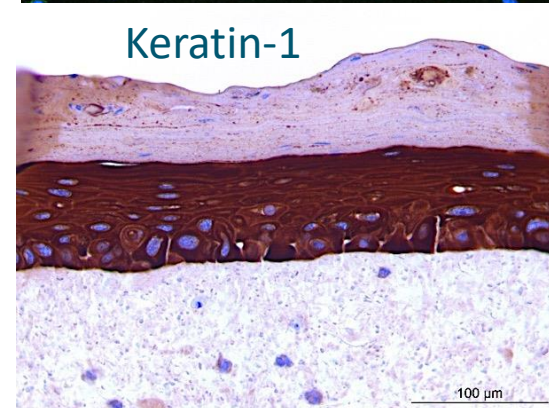
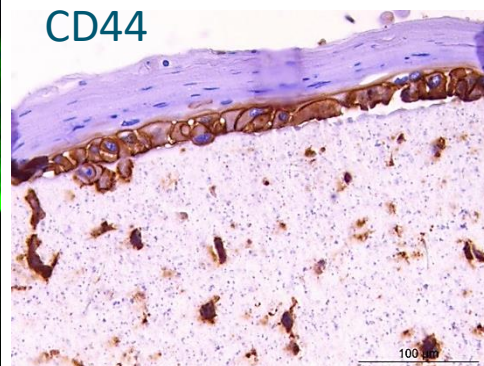
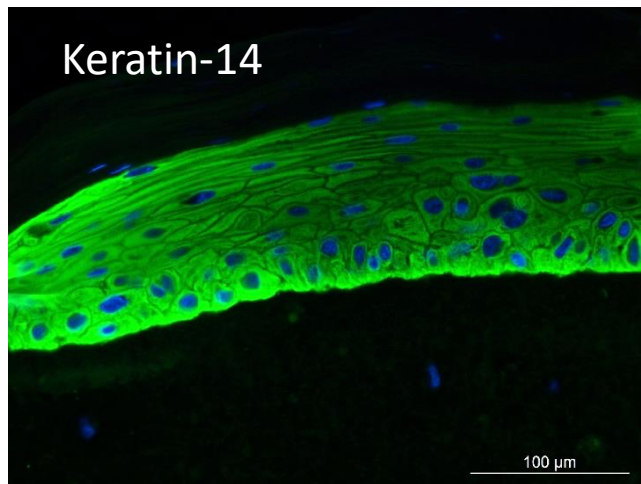
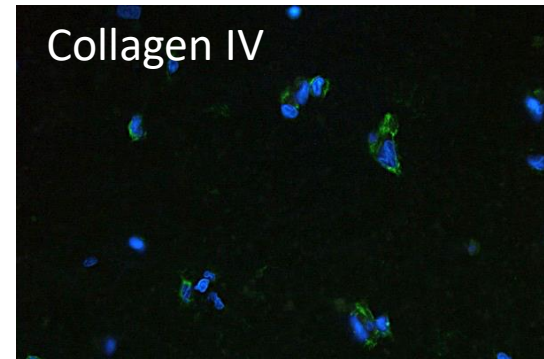
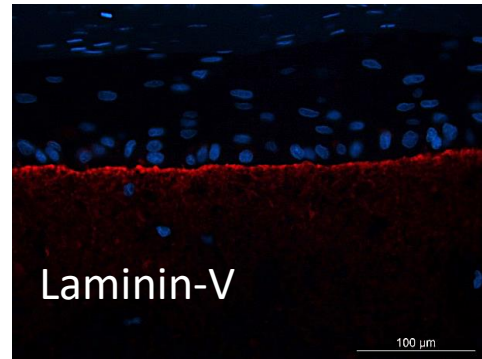
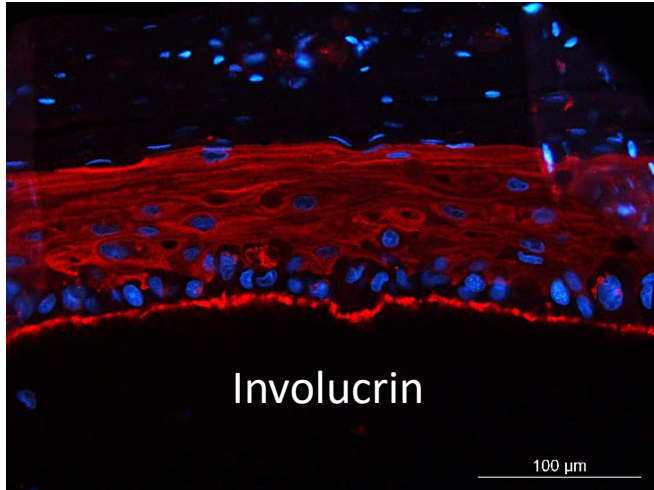
CTIBIOTECH Worldwide



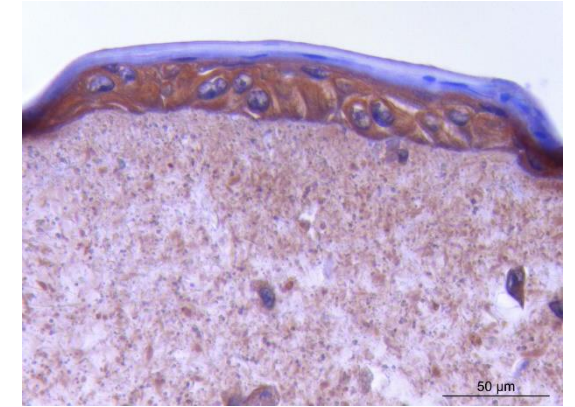
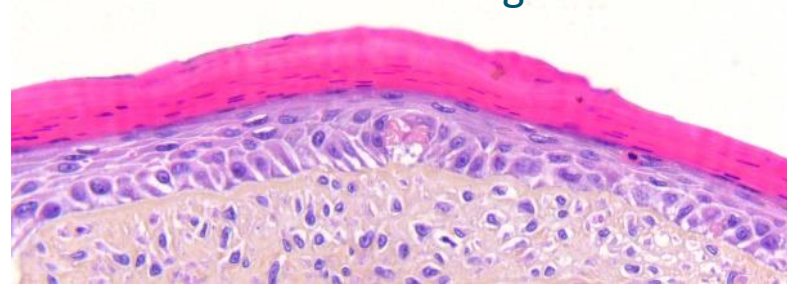
Basic skin models are great for toxicology and efficacy testing

Human skin production by 3D-Bioprinting

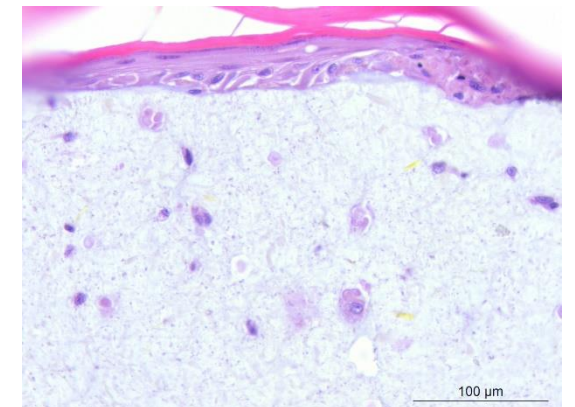
Skin care / sensitive skin / aging / etc



HES staining



Aging study
(hyaluronic acid synthases)

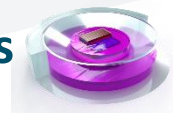


Matrix structure effects

Complex skin models are needed for research and product development



3D Bioprinted immunized skin models



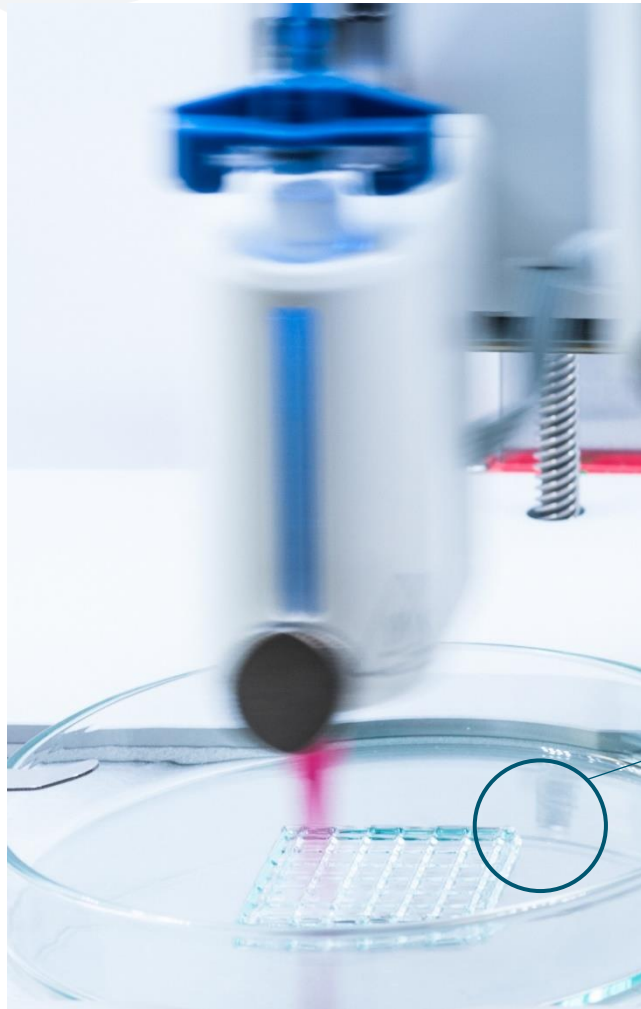
IFSCC Winner 2022 !!!

Maxime Lègues has been nominated for the **Henry Maso Award** for the work on this paper.

The World's First 3D Bioprinted Immune Skin Model Suitable for Screening Drugs and Ingredients for Normal and Inflamed Skin

Maxime Lègues¹, Clément Milet¹, Nico Forraz¹, Nicolas Berthelemy², Sabine Pair², Valerie André-Frei², Sebastien Cadau², Colin McGuckin¹

¹ CTIBiotech Cell Therapy Research Institute, 5 avenue Lionel Terray, 69330 Meyzieu-Lyon, France
² BASF Beauty Care Solutions France, 32 rue St Jean de Dieu, Lyon, France

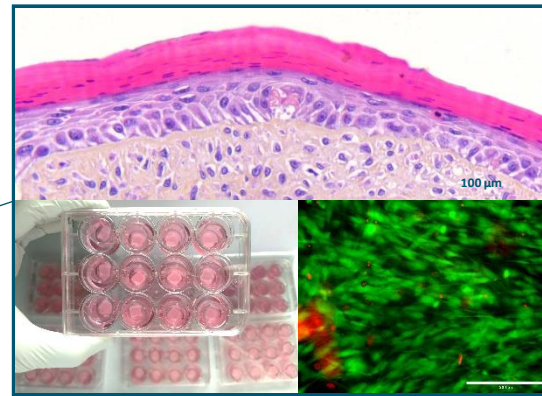


3D bioprinting

Collaboration with Sebastien Cadau

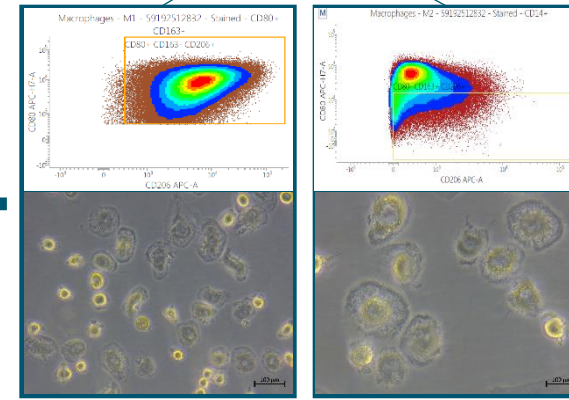


Blood donor



3D skin models

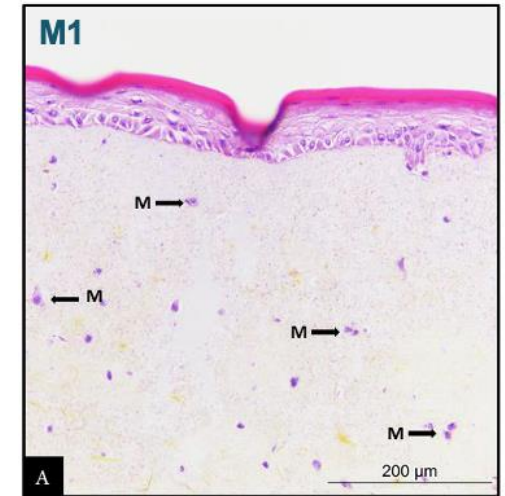
+



M1

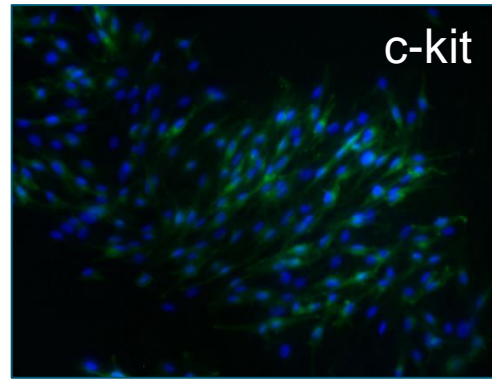
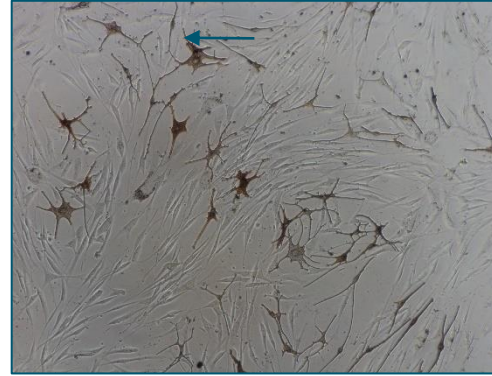
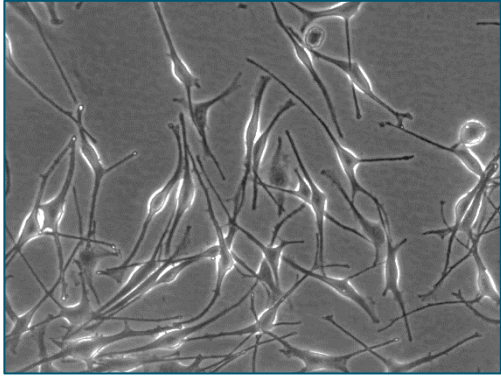
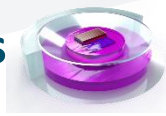
M2

+ Immunized cells

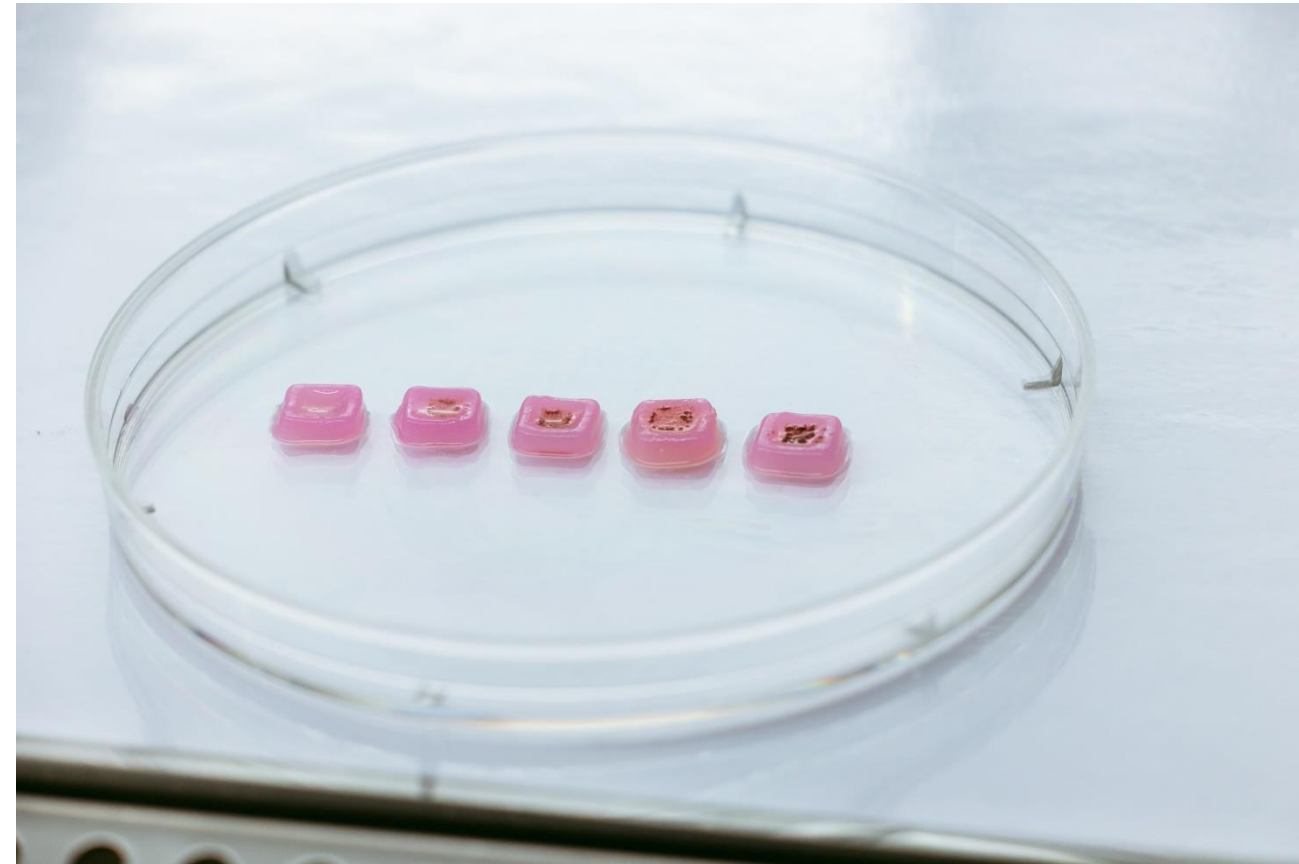


3D immunized skin models

3D Bioprinted Pigmented skin models

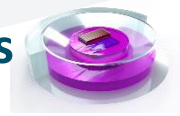


Melanocytes / Blasts

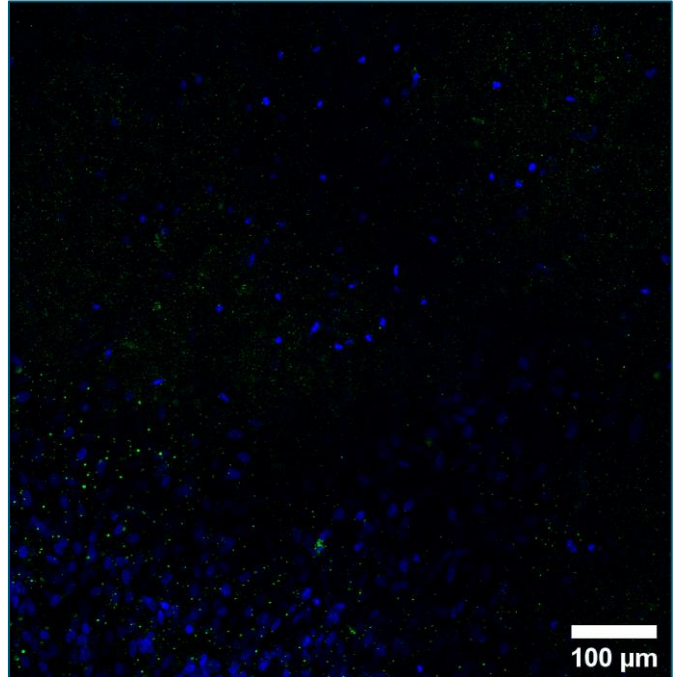
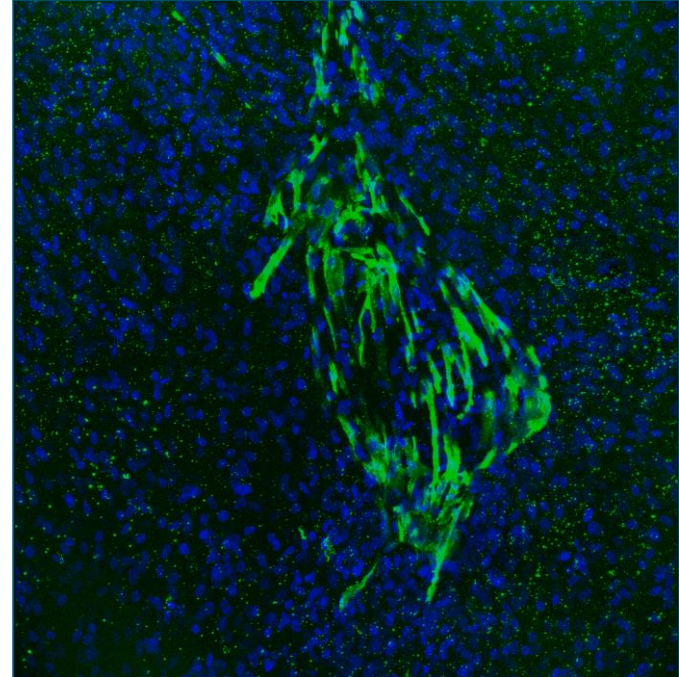
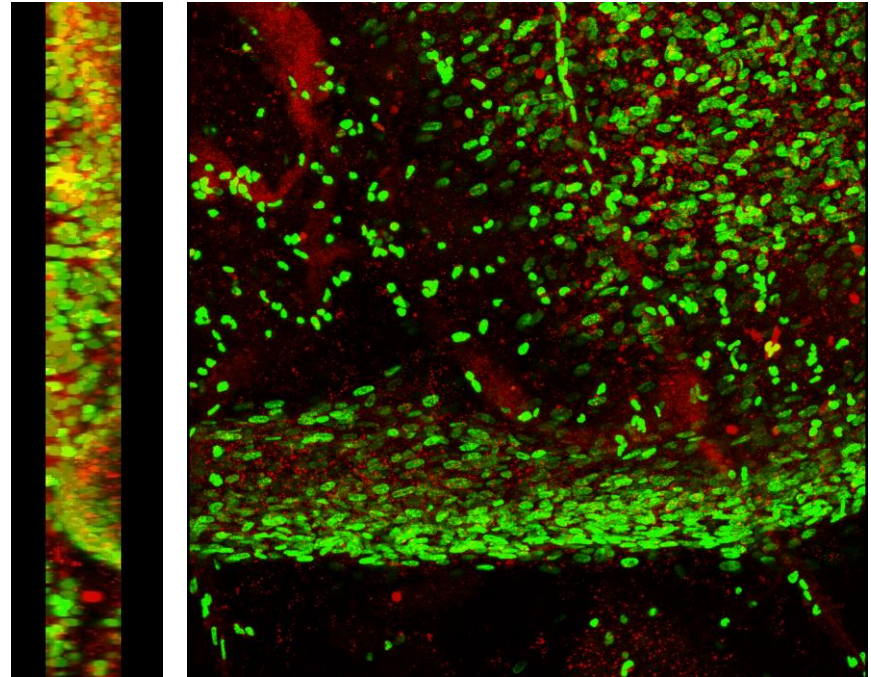


Because it is important to test **EVERY** color and type of skin

3D Bioprinted Vascularized skin models

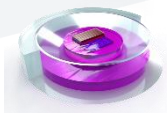


IFSCC Podium 2022



CLARIANT^E

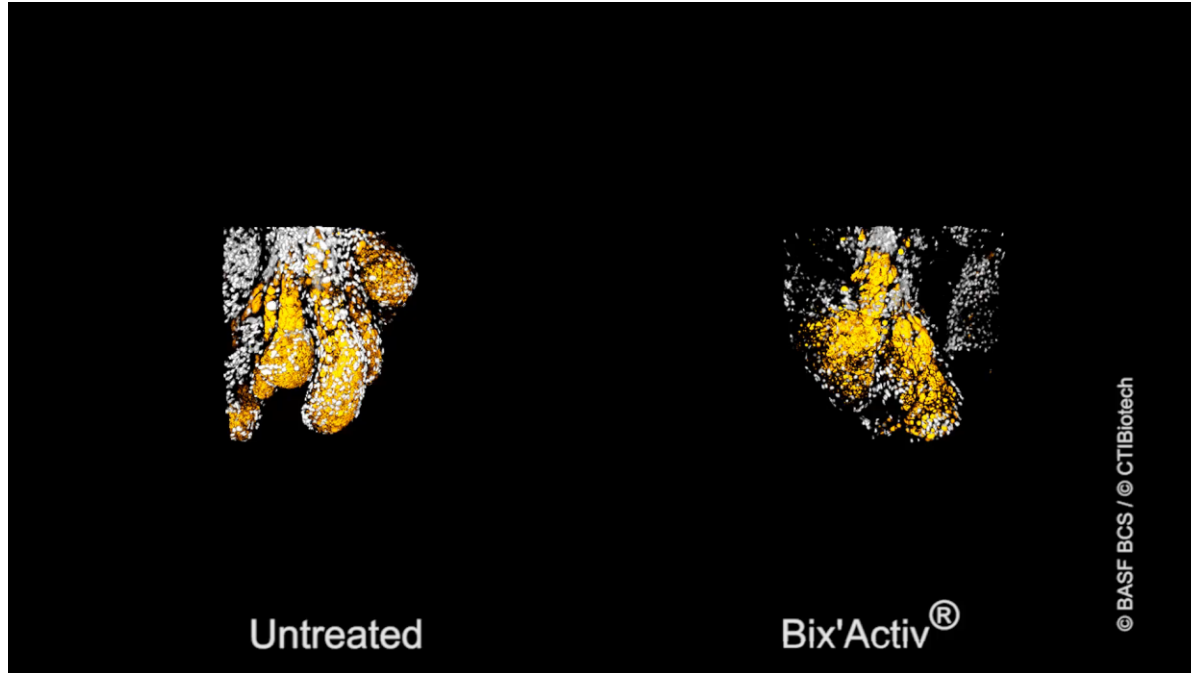
3D Bioprinted skin with growing hair



Full sebaceous gland models and sebocytes testing

Full sebaceous gland test

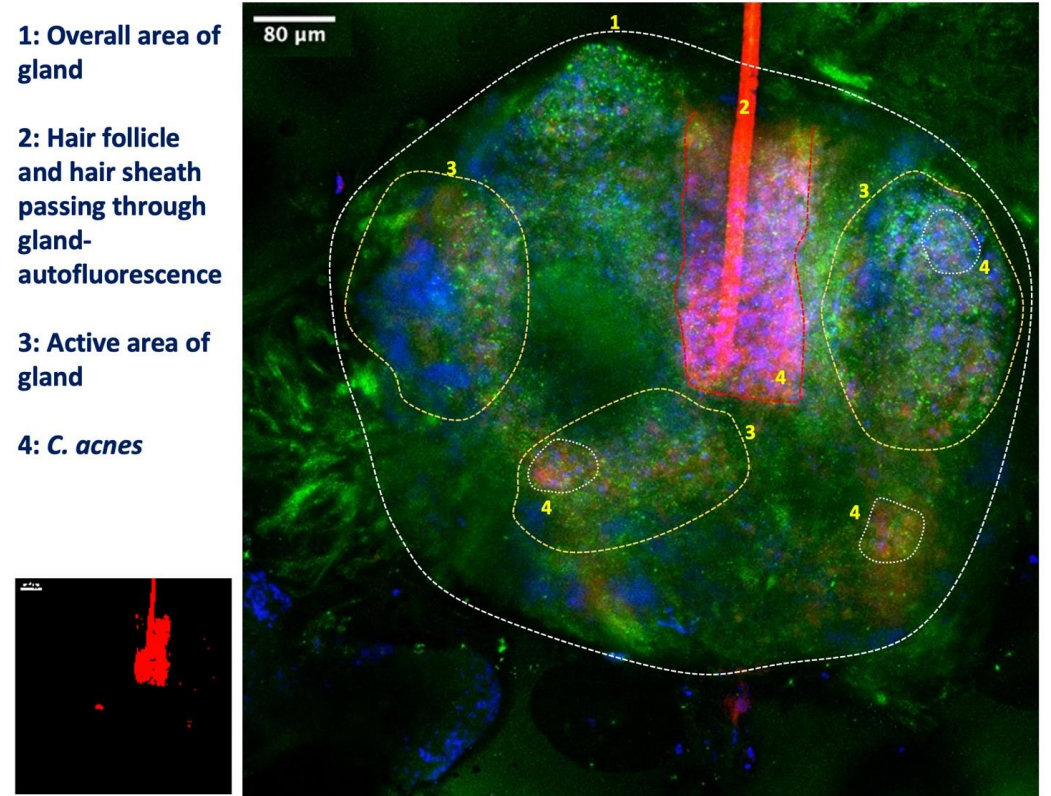
IFSCC, 2017



Microbiome study

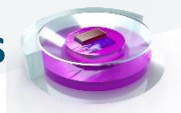
IFSCC, 2022

- 1: Overall area of gland
- 2: Hair follicle and hair sheath passing through gland-autofluorescence
- 3: Active area of gland
- 4: *C. acnes*



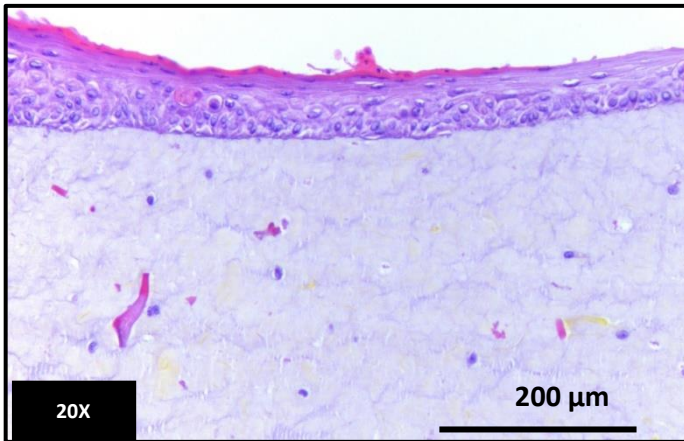
(Orientation corrected to the skin surface view)



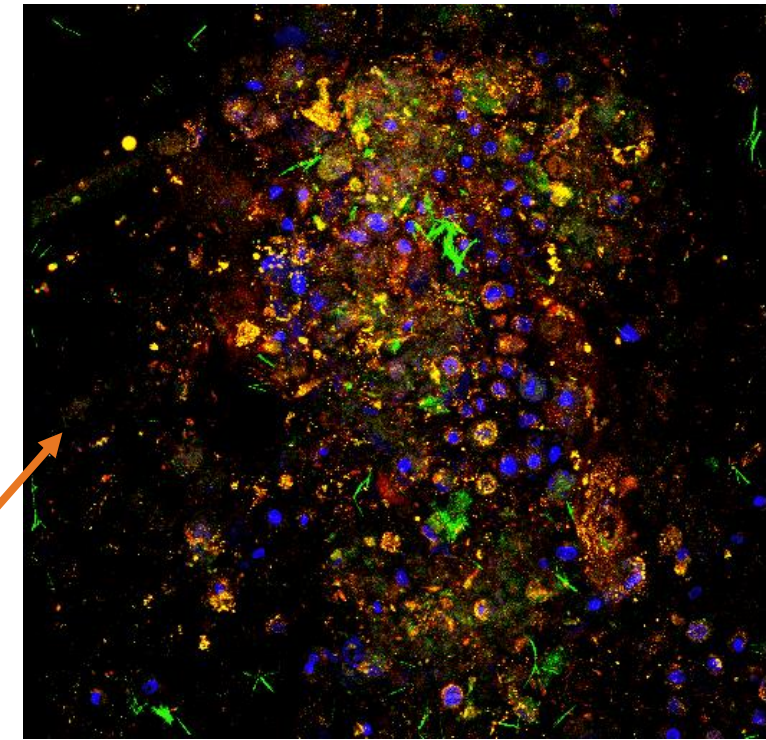
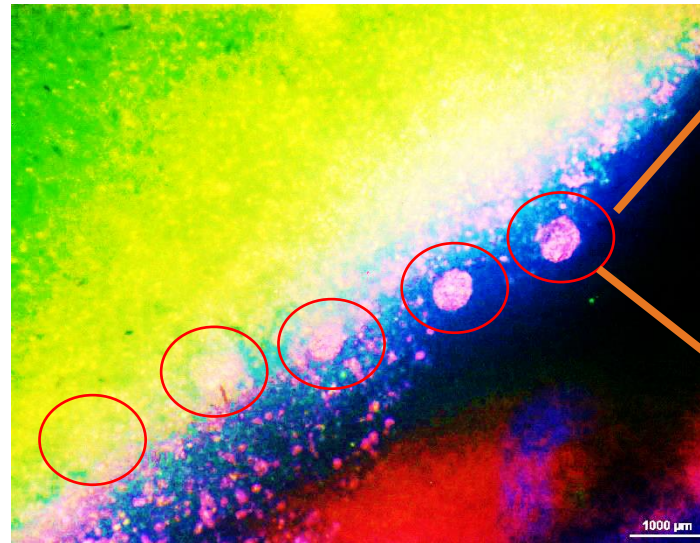


Printing of microsebaceous glands achieved

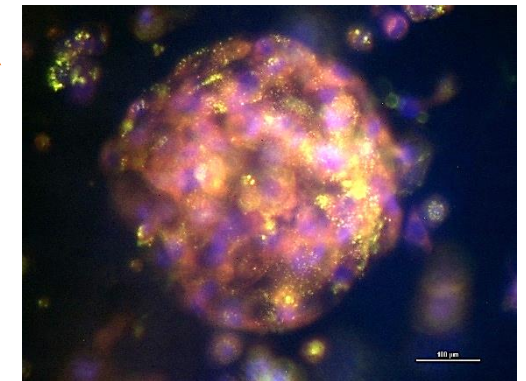
HES Coloration



Nile Red



3D Printed Oil Glands

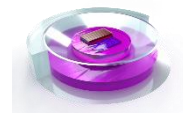


A 'solar system' of donor-specific human sebaceous glands was produced

Beiersdorf

(Collaboration with Beiersdorf Corporation – IFSCC 2020 YOKOHAMA)

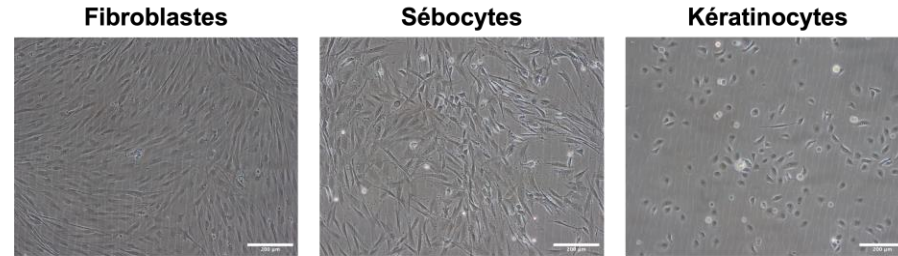
3D Printed Oily skin models with BIOIMPEDANCE testing



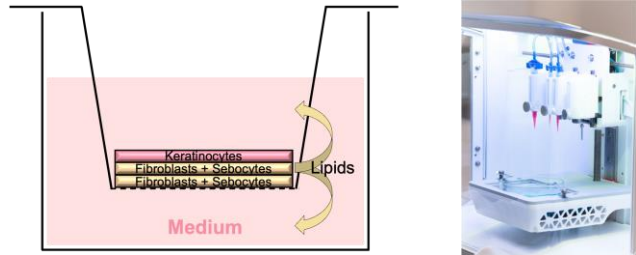
METHODS

IFSCC, 2022

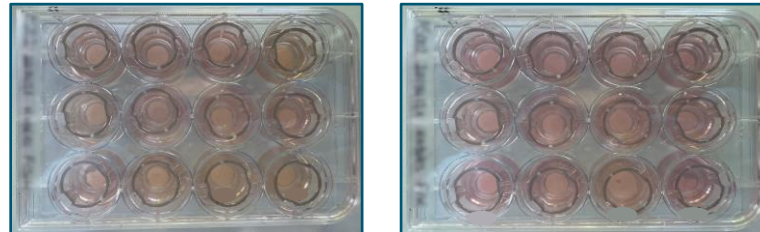
Cells isolation



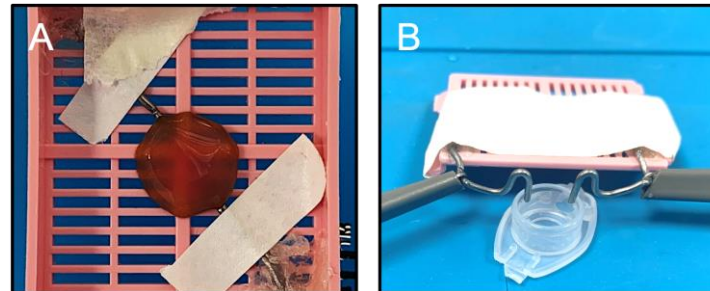
3D Bioprinting



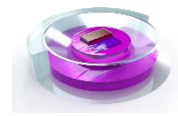
Lipid modulation



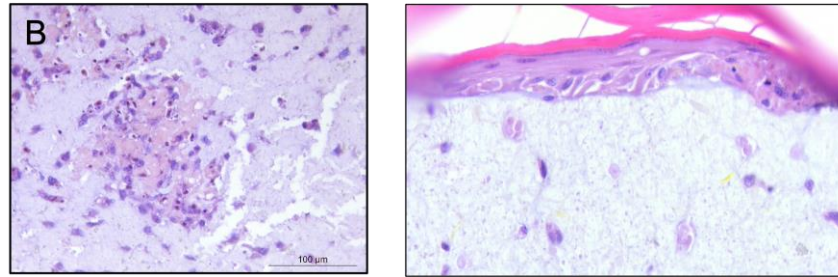
Bioimpedance



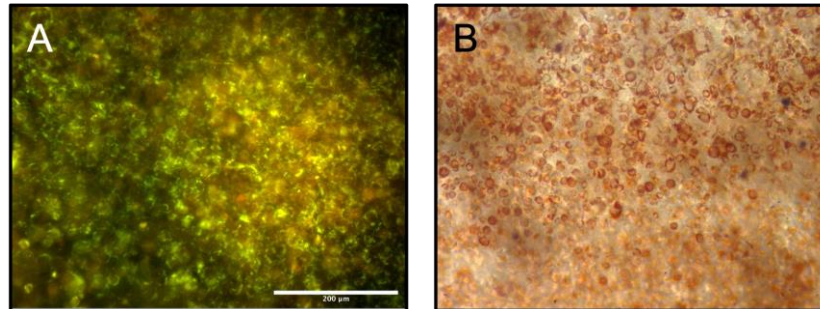
(Collaboration with Gattefosse Corporation – IFSCC 2022 LONDON)



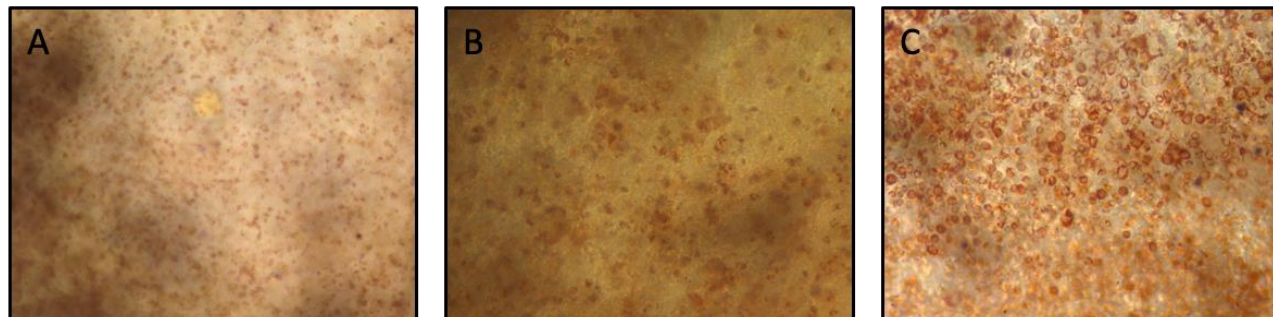
Sebaceous formation



Oil Red

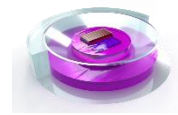


Lipid modulation

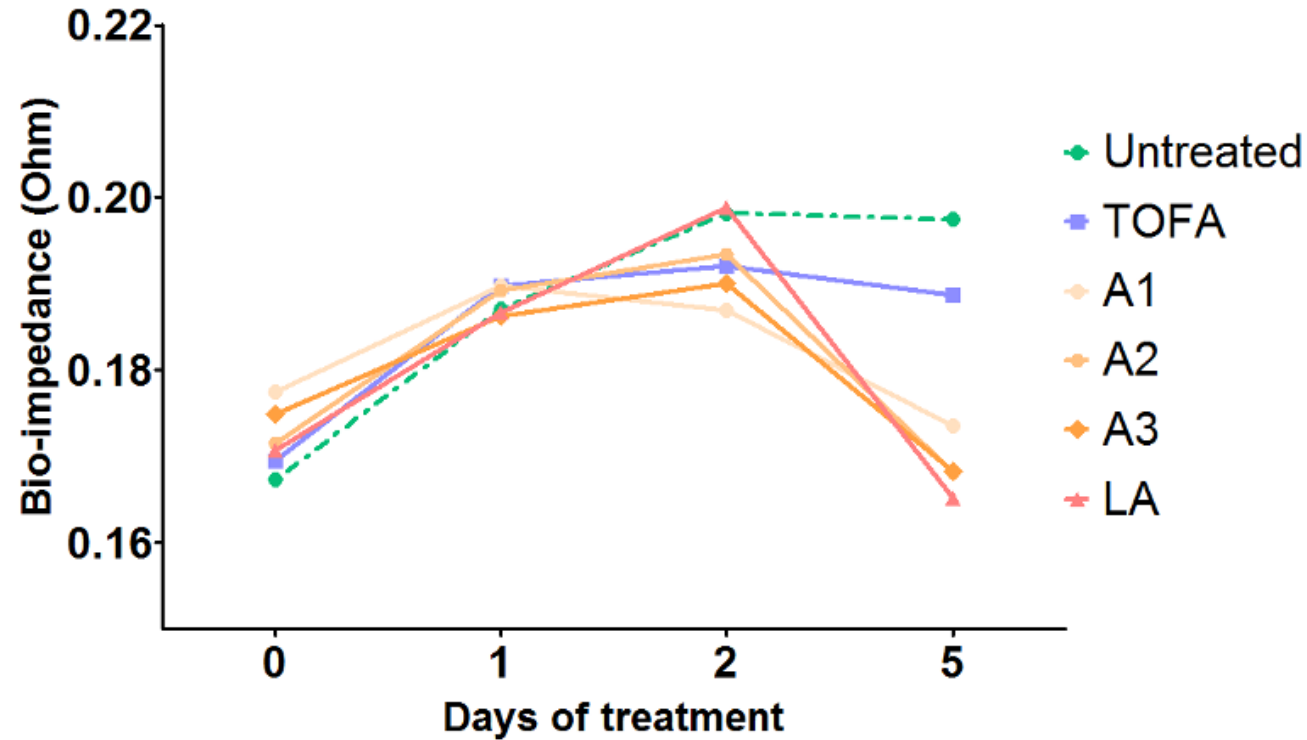


A) Untreated control medium only, B) TOFA 50 µM, C) Linoleic acid 1 mM.

(Collaboration with Gattefosse Corporation – IFSCC 2022 LONDON)



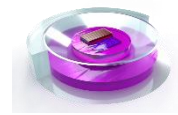
Bioimpedance with time



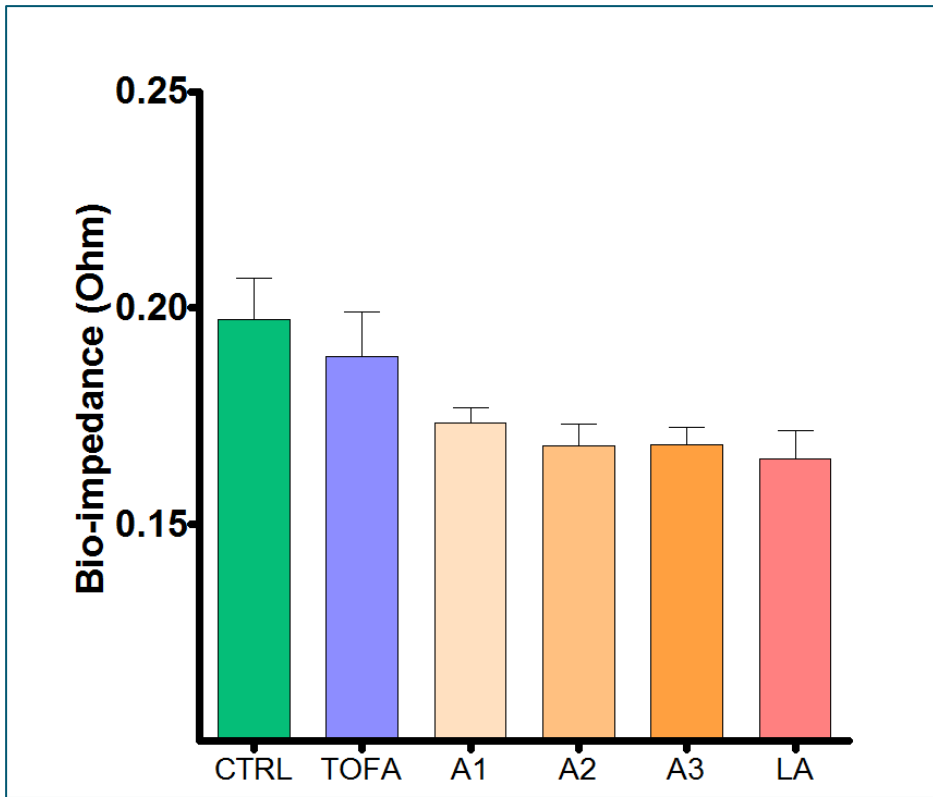
Test of 3D structure

A1, A2, A3 GATTEFOSSE actifs. Control. Tofa, LA / AL Linoleic acid

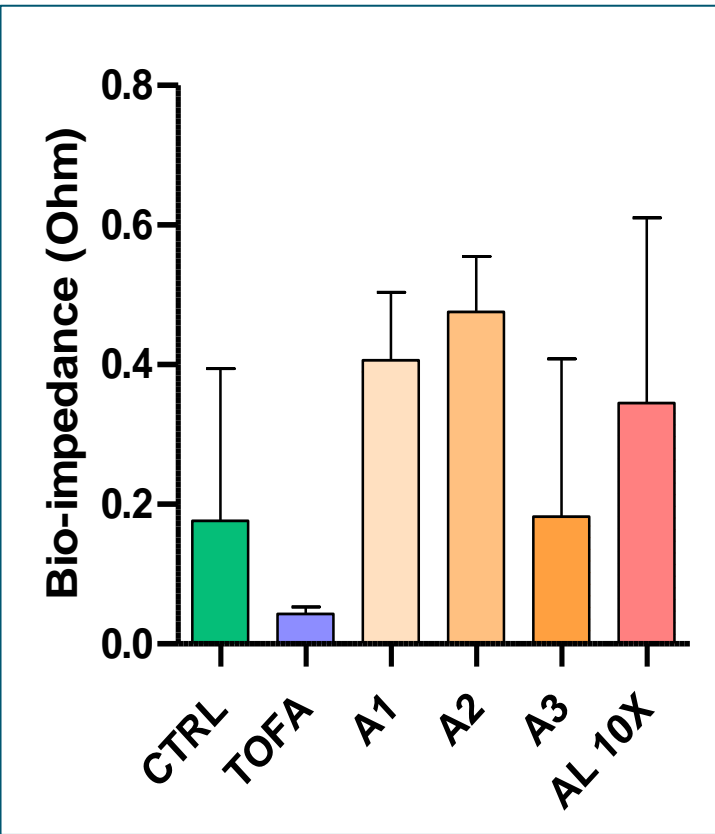
(Collaboration with Gattefosse Corporation – IFSCC 2022 LONDON)



Supernatant Oil production J5



Internal Models



A1, A2, A3 GATTEFOSSE actifs. Control. Tofa, LA / AL Linoleic acid

(Collaboration with Gattefosse Corporation – IFSCC 2022 LONDON)

Conclusions

- Non-invasive assessment brings innovation closer to clinical testing
- Non-invasive assessment allows longer time period testing of actives
 - And re-testing
- GATTEFOSSE actives were successful in reducing oil production out of the sebaceous formations
- Bioimpedance is useful in a laboratory testing strategy for cosmetics actives.

(Collaboration with Gattefosse Corporation – IFSCC 2022 LONDON)

Thank you !!!



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