invent DCU
INNOVATION & ENTERPRISE

Dublin City University
Partnering Opportunity

LIFE SCIENCES

Memsense - Lipid Bilayer Membrane Model Platform for Drug Discovery

INTRODUCTION

MemSense is an advanced *true* lipid bilayer membrane platform developed as a cell membrane model for application in pre-formulation studies of new molecules and drug delivery vehicles in drug discovery in the pharmaceutical and cosmetics industry. It is also an effective tool for predicating membrane based toxicity across both pharma and range of diverse domains from agrichemicals to environmental science.

MemSense is a chip-based cell membrane model which comprises lipid bilayers assembled across ordered arrays of aqueous (typically buffer) filled hemispherical microcavities prepared in polymer and/or metal over polymer. It is a robust platform providing versatility over lipid composition and composition of the contacting medium at proximal and distal bilayer interface, not possible in any other substrate.

Currently presented in a simple single channel microfluidic format, it offers a significant advance over current models used by industry in testing of new molecules during drug discovery in early preclinical testing. MemSense can deliver molecular level insights into molecule-membrane interactions and transcellular transport, at the very preliminary stages of the development pipeline, replacing Log P/D, IAMs and PAMPA with a single a low cost but robust stop/go assessment of permeability and potential toxicity in drug/cosmetic or agrichemical molecules before they advance to more expensive tissue/cell culture.

Key Characteristics

- ✓ MemSense comprises an array of uniform hemispherical micropores, which are aqueous filled
  and over which is assembled a lipid bilayer.
- ✓ The bilayer is highly fluidic, stable, easy to assemble and has very versatile composition.
- ✓ Replacement & improvement over Log P & Log D studies
- ✓ MemSense can be used to assess and quantify molecule-membrane permeation and transport
- ✓ Complex membrane models are possible including incorporation of membrane proteins, glycolipids to model a wide array of biological membrane interfaces from gastrointestinal tract, Blood Brain barrier , epithelia or stratum corneaum through to diseased cell membranes.

IP STATUS

A patent application was filed in June 2014 – Publication Number WO2016001391.

TYPE OF BUSINESS SOUGHT

We are interested to talk to companies interested in collaborations and strategic partnerships.

CONTACTS

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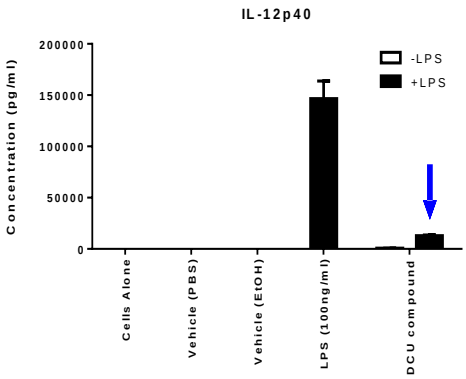
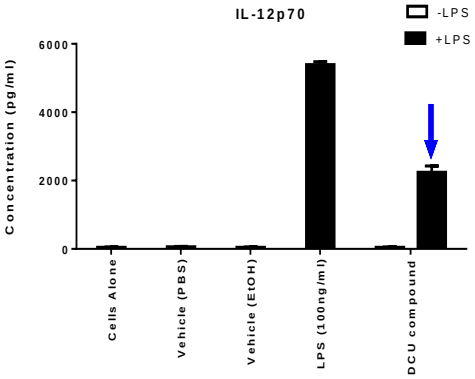
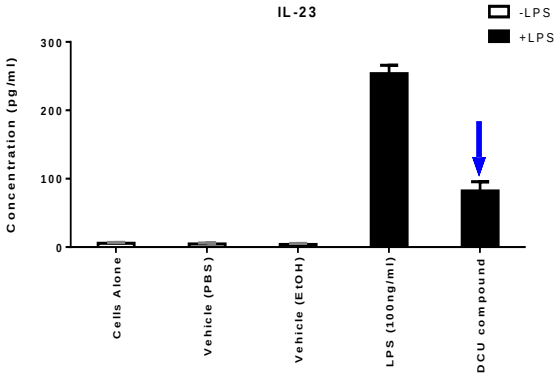
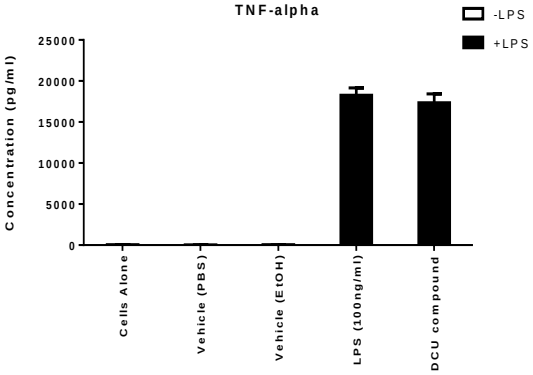
Example Data

In vitro analysis: Bone marrow dendritic cells were conditioned with the novel DCU marine compound for one hour prior to stimulation of lipopolysaccharide (LPS). LPS is found on the cell wall of certain bacteria (gram negative) and stimulates an immunogenic response. After 24 hours, the supernatants were removed and analysed for cytokine levels of IL-12p40, IL-12p70, IL-23 and TNF-alpha using specific immunoassays. The results clearly show that the marine compound has the ability to suppress the pro-inflammatory cytokines IL-12p40, IL-12p70 and IL-23. However, it does not effect TNF-alpha which demonstrates the specificity of this novel DCU compound.

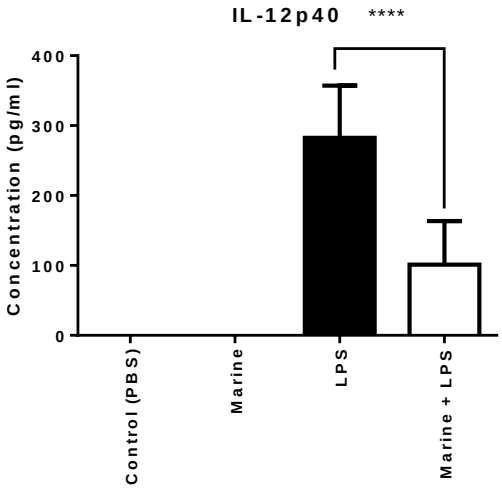

IL-12p40
Concentration (pg/ml)
200000
150000
100000
50000
0
-LPS
+LPS
Cells Alone
Vehicle (PBS)
Vehicle (EtOH)
LPS (100ng/ml)
DCU compound


IL-12p70
Concentration (pg/ml)
6000
4000
2000
0
-LPS
+LPS
Cells Alone
Vehicle (PBS)
Vehicle (EtOH)
LPS (100ng/ml)
DCU compound


IL-23
Concentration (pg/ml)
300
200
100
0
-LPS
+LPS
Cells Alone
Vehicle (PBS)
Vehicle (EtOH)
LPS (100ng/ml)
DCU compound


TNF-alpha
Concentration (pg/ml)
25000
20000
15000
10000
5000
0
-LPS
+LPS
Cells Alone
Vehicle (PBS)
Vehicle (EtOH)
LPS (100ng/ml)
DCU compound

In vivo Analysis: An *in vivo* study (LPS Shock Model) was performed on BALB/c female mice which were aged 17-19 weeks. The mice were divided into four groups: (1) mice administered PBS (control) via IP injection, (2) mice administered marine DCU compound (Marine) via IP injection, (3) mice administered LPS via IV injection and (4) mice administered marine DCU compound via IP injection two hours before LPS IV injection. Six hours after LPS injection, each of the mice were culled and serum was collected to measure cytokine levels (IL-12p40, INF-gamma, IL-1β) by ELISA It was shown that the marine DCU compound suppressed the pro-inflammatory cytokines therefore exhibiting an anti-inflammatory effect.



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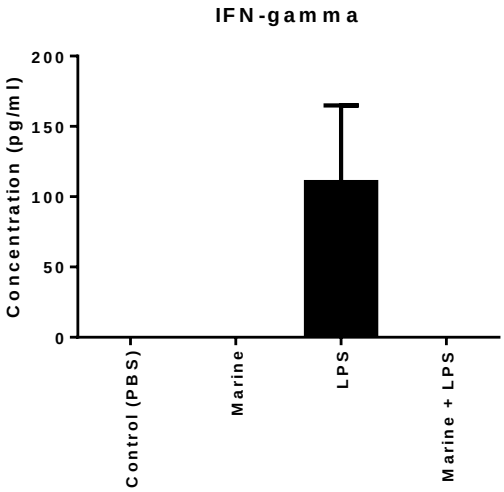

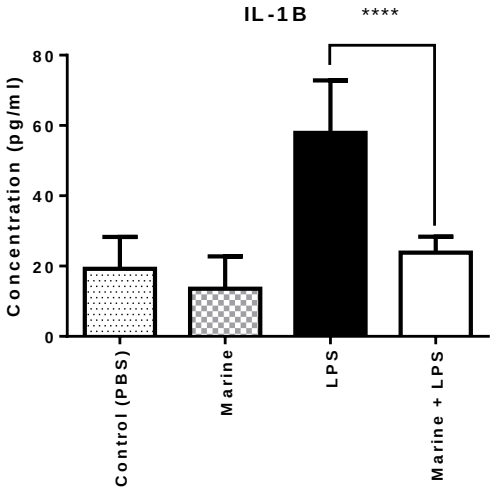

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