Towards Bioengineering: Optimization of a New Probucol-Bile Acid Delivery System for Inflammatory/Stress Conditions - Method Optimization and *In-Vitro* Study

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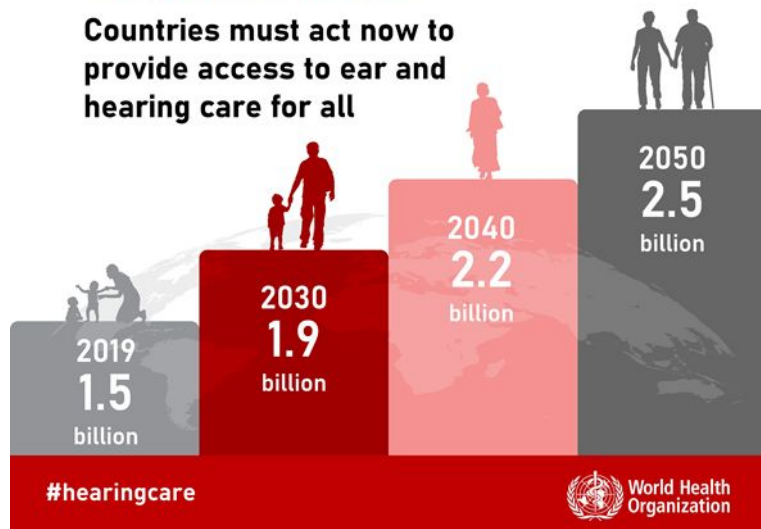Contact: susbinraj.wagle@postgrad.curtin.edu.au

Oxidative stress-induced Hearing Impairment (HI)

https://hearinghealthfoundation.org/blogs/8-tips-for-the-new-hearing-aid-user

- Unless proper action is taken
- Sensorineural hearing loss
- Inner ear or nerve damage
- The etiology of hearing loss is complex and diverse,
- Oxidative stress is considered to be an important causes of HI.

Probucol (PB)

Trans-tympanic injection
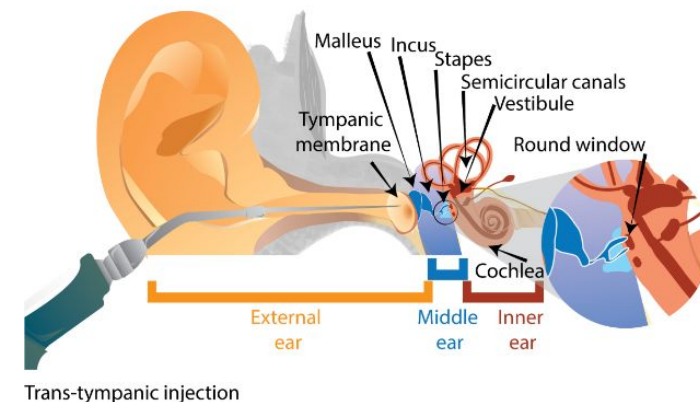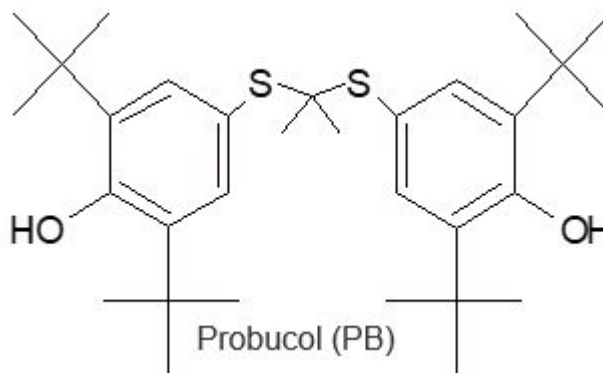
- Advanced drug formulations, particularly nanoparticles, offer a promising approach to enhance drug delivery efficacy and overcome these obstacles.

Method and Result: Characterization

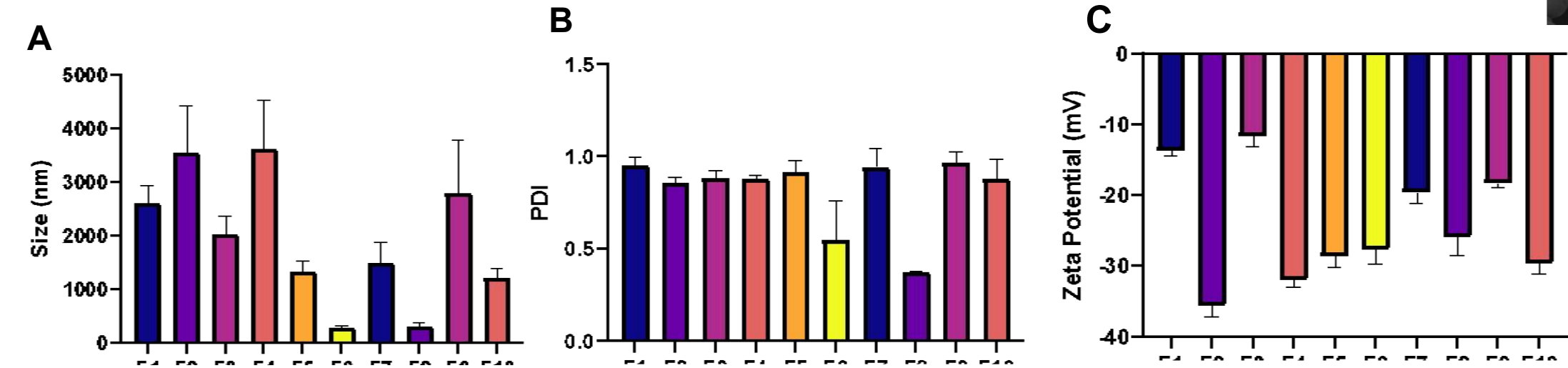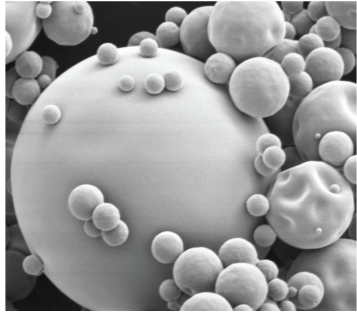| Formulations code	Low-viscosity sodium alginate (LVSA)	Tween-80	Polyvinyl alcohol (PVA)	Poly (L-ornithine) (PLO)	Polystyrene sulfonate (PSS)	Polyacrylic acid (PAA)	Poloxamer-407	Gelatine	Silk Fibroin protein	Bile acid (BA)	Probucol (PB)
F1	1.7	1.7	1.3	1.1	0.35	0.35	1	0.8	0.7	0.45	0.25
F2	1	1.7	1	1	0.35	0.35				0.45	0.25
F3	0.8	1.7	1	1	0.35	0.35	1	0.8		0.45	0.25
F4	0.8	1.7	1	1	0.35	0.35				0.45	0.25
F5	0.8	1.7								0.45	0.25
F6	0.6	1.7								0.45	0.25
F7	0.6	1.7	1				1			0.45	0.15
F8	0.6	1.7								0.45	0.15
F9	0.3	1.7	1				1			0.45	0.15
F10	0.3	1.7	1							0.45	0.15

Figure 1: Nanoparticle characterisation: A) Particle size, B) polydispersity index (PDI), and C) Zeta potential calculated using Zetasizer. Data are mean ± standard deviation (n = 3, one-way ANOVA, ****p < 0.0001).
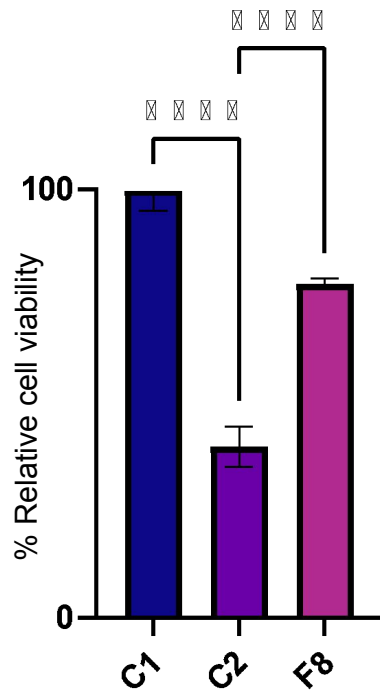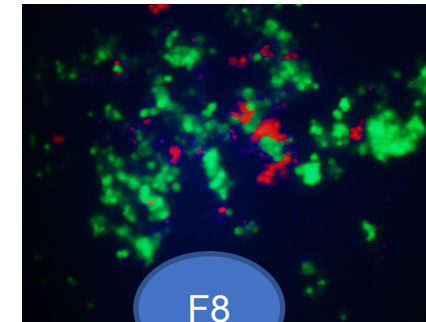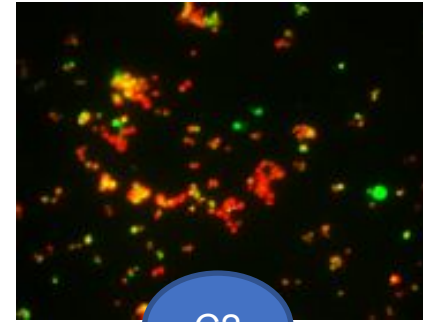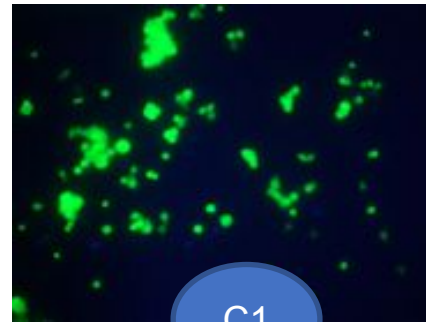
Result: *In vitro* Study

Cell stressor + capsules
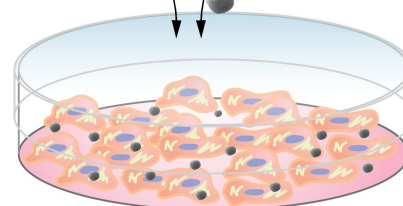
The House Ear Institute-Organ of Corti -1 (HEI-OC-1), a mouse auditory cell line.
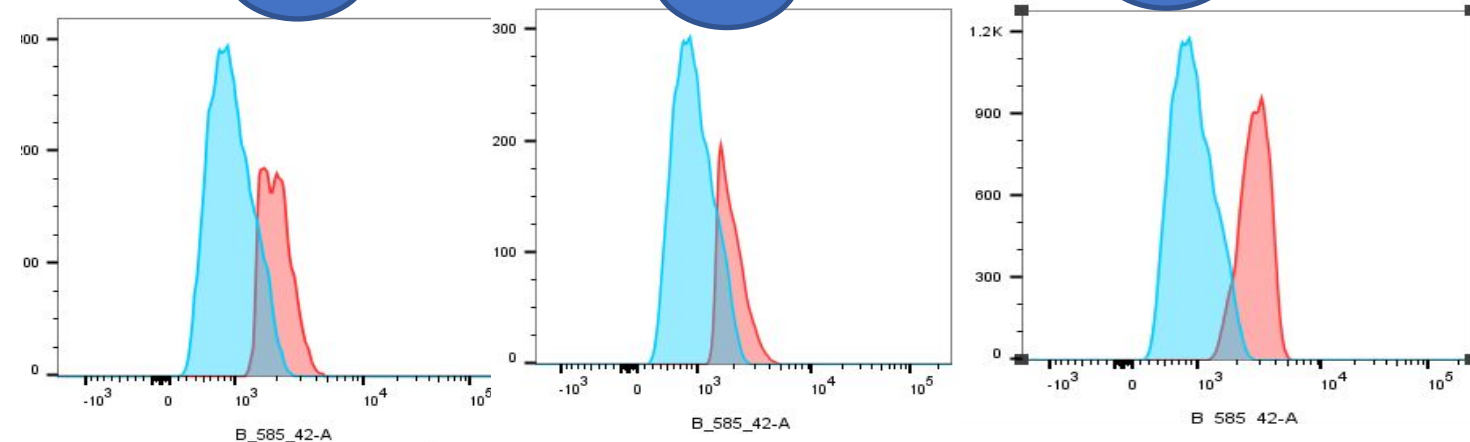
Figure 2: *In vitro* Study: A) Cell viability via WST-1 assay; B) Live/dead cell staining with Calcein AM (green = live, red = dead); C) Caspase-9 activity via flow cytometry (positive and negative cells). Data are mean ± standard deviation (n = 3, one-way ANOVA, ****p < 0.0001). C1: Healthy cells; C2: Oxidatively stressed cells (baseline); F8: Stressed cells treated with LVSA-PB-LCA nanoparticles

Conclusion and Future Direction

https://www.calmclinic.com/anxiety/symptoms/auditory-hallucinations

HurryHurry!!!

PB-BA based nanoparticles could be breakthrough in preventing hearing impairment

- Further research is warranted to explore their full potential.

Thank you

Acknowledgments