

Marine Functional Foods

PhD Student:

Miss Louise McGeagh

Supervisors:

Dr Chris Gill, Dr Emeir Duffy, Dr Pamela Magee & Prof. Sean Strain

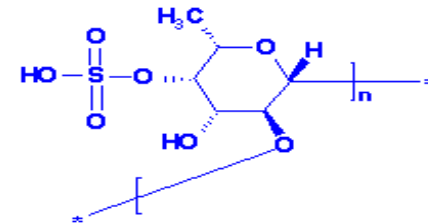
Project Background

- Colorectal cancer (CRC) accountable for >16000 of all cancer deaths in UK
(Olsen *et al.* 2008)

- Biologically active food ingredients (bioactive compounds) may have protective roles in disease/illness

- Bioactive compounds used in functional food development

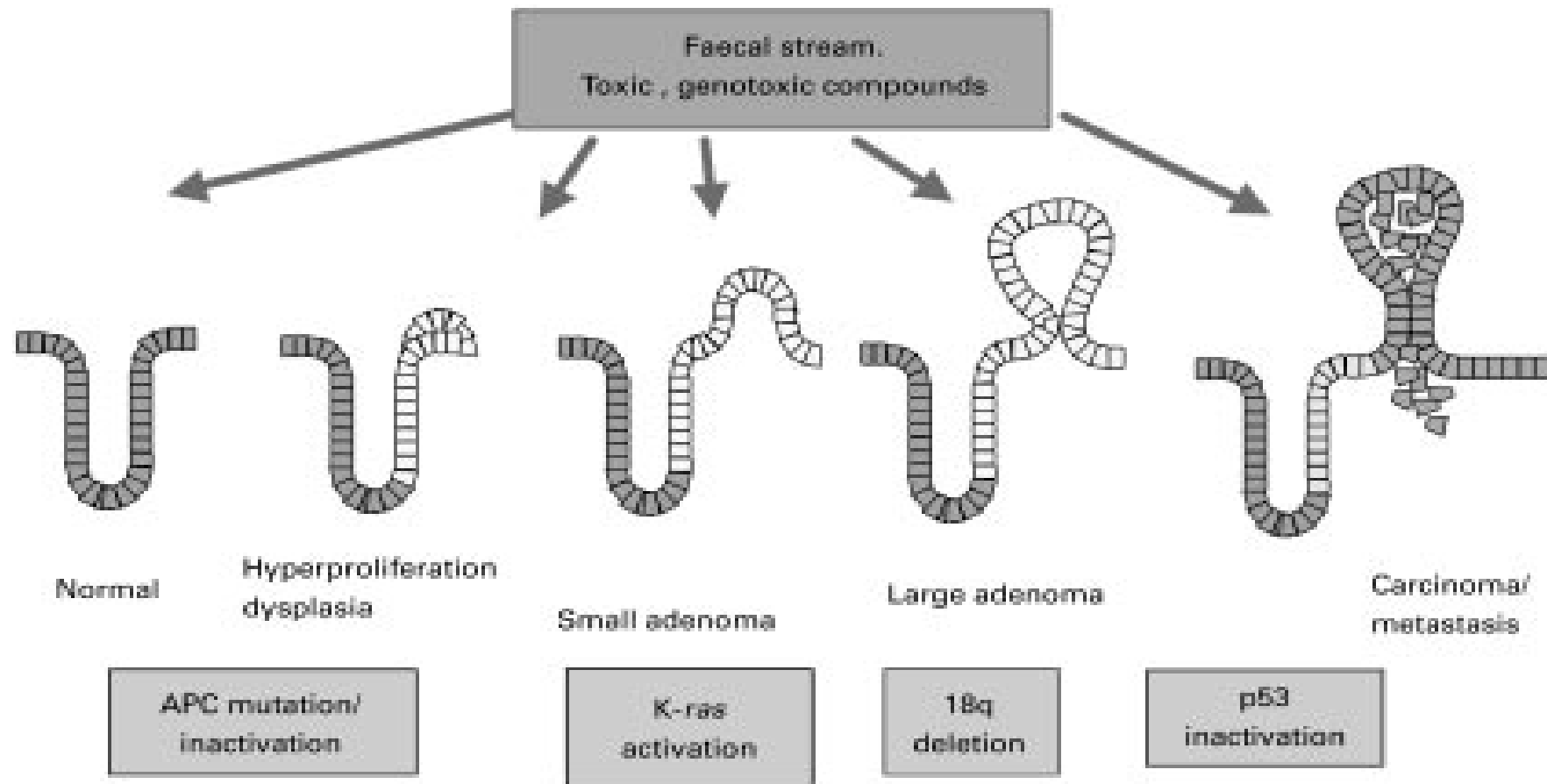
- Fucoidan in brown seaweed
(anti-tumour potential) (Koyanagi *et al.* 2003)



Fucoidan structure (Source: http://chemdb.niaid.nih.gov/struct_search)

- Health benefits of seaweeds not fully understood

CRC Development



(Gill and Rowland, 2002)



Project Aims

- To assess the anticancer activity of seaweed phytochemicals
- To compare the phytochemical profile of seaweed extracts
- Use a series of cell models representative of major CRC stages (HT29, CaCo-2 & HT115 cell lines)
- Use 3 different extract types for each of 3 different seaweed classifications

Seaweed Classifications

- Chlorophyta (green algae)



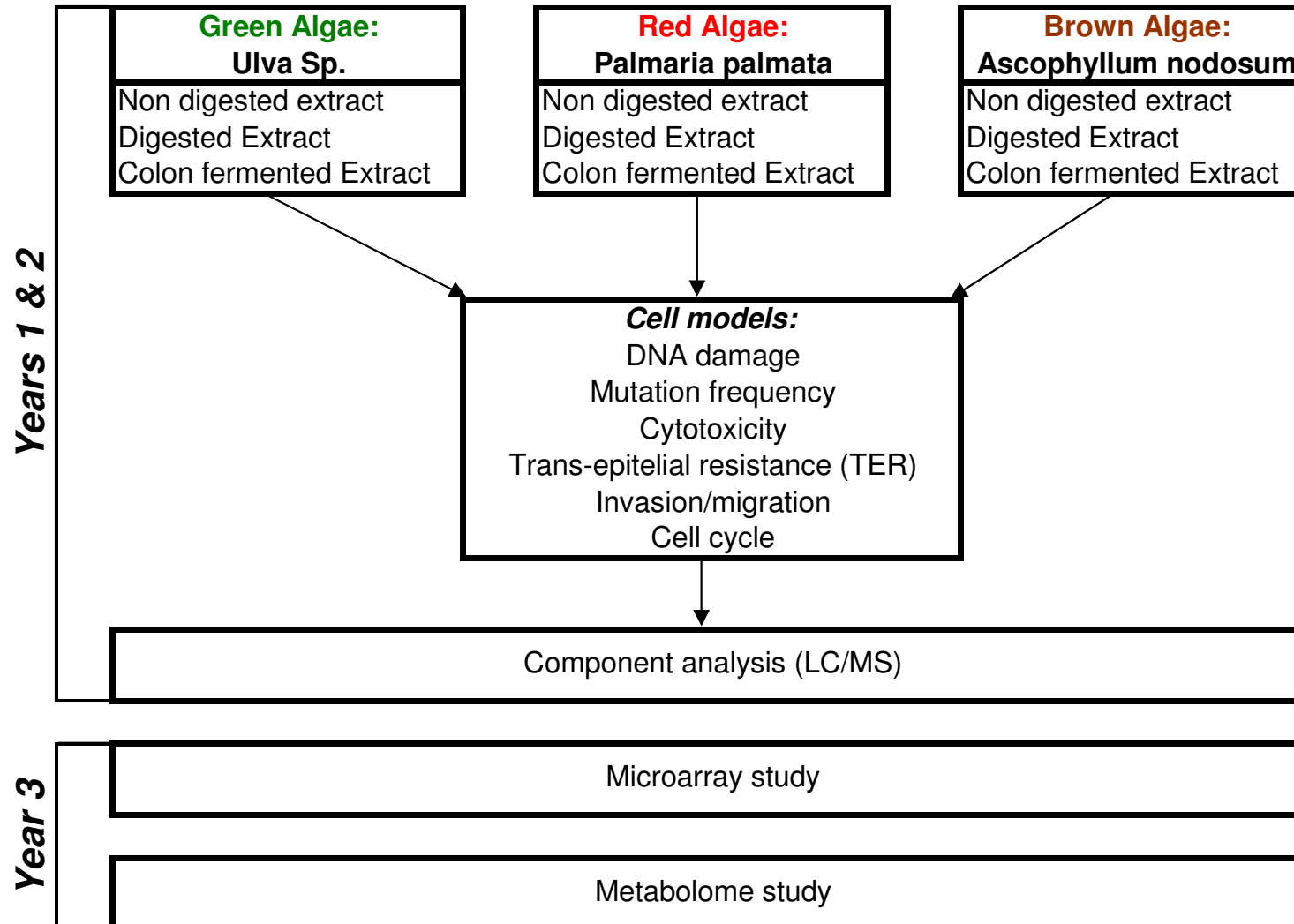
- Rhodophyta (red algae)

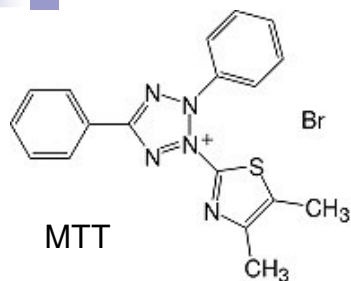


- Phaeophyta (brown algae)



Study Design





Practical Methods

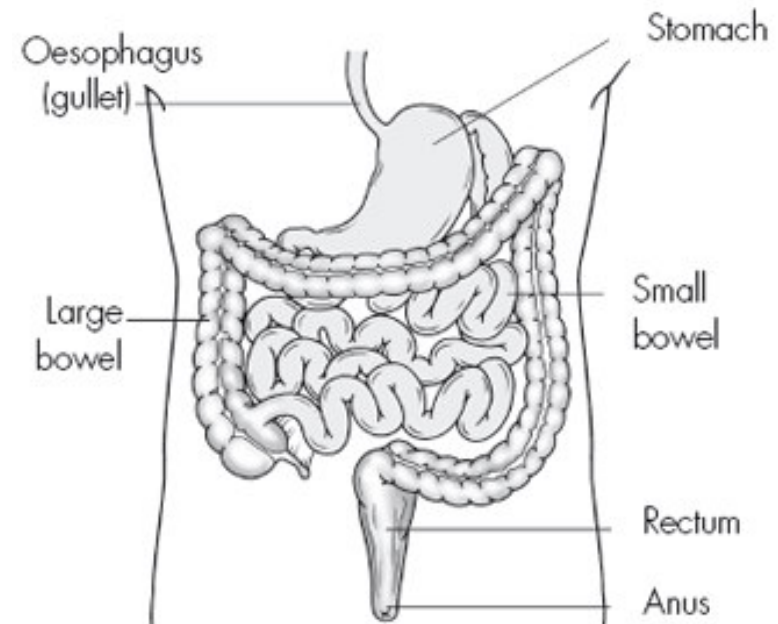


- Cell kinetics
- Comet assay
- Mutation frequency assay
- MMT* cytotoxicity assay
- Trans-epithelial resistance (TER) assay
- Matrigel invasion assay
- Liquid chromatography mass spectrophotometry (LC/MS)

*MTT = 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide)

Digestion and Fermentation

- Batch *in vitro* digestion:
 - Homogenised seaweed extract
 - Gastric digestion
 - Pancreatic digestion
 - Colon available extract
- Batch *in vitro* fermentation
 - Faecal material suspension
 - Colon available extract
 - Buffer/culture medium
 - Incubate in anaerobic conditions



Summary

- CRC leading cause of morbidity and mortality
- Altering the diet can assist with prevention of CRC
- Seaweeds prospective source of bioactives
- Assessing extracts at different stages of CRC will indicate if they have potential anticancer activities





References

- Gill, CIR and Rowland, IR (2002) Diet and cancer: assessing the risk. *British Journal of Nutrition* **88**: S73-S87.
- Koyanagi, S; Tanigawa, N; Nakagawa, H; Soeda, S and Shimeno, H (2003) Oversulfation of fucoidan enhances its anti-angiogenic and anti-tumour activities. *Biochemical Pharmacology* **65**: 173-179.
- Olsen, AH; Parkin, DM and Sasieni, P (2008) Cancer mortality in the United Kingdom: projections to the year 2025. *British Journal of Cancer* **99**: 1549-1554.
- Yuan, YV and Walsh, NA (2006) Antioxidant and antiproliferative activities of extracts from a variety of edible seaweeds. *Food and Chemical Toxicology* **44**: 1144-1150.



Acknowledgements

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