

NIHR Southampton Biomedical Research Centre

University Hospital Southampton NHS Foundation Trust

## Nutritionists role in the Prevention and Treatment of Cancer and Nutrition

Alan A Jackson  
NIHR Cancer and Nutrition Infrastructure Collaboration  
WCRF Chair, Continuous Update Project

Nutrition Society, Winter Meeting  
Royal Society of Medicine 5-6<sup>th</sup> Dec 2017

The Southampton Biomedical Research Centre is funded by the National Institute for Health Research (NIHR) and is a partnership between University Hospital Southampton Foundation Trust and the University of Southampton

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Department of Health  
Report on Health and Social Subjects  
48  
Nutritional Aspects of the Development of Cancer

Report of the Working Group on Diet and Cancer of the Committee on Medical Aspects of Food and Nutrition Policy

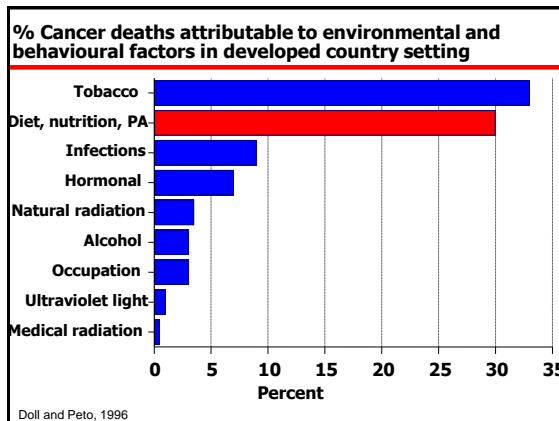
The Stationery Office

Sir Kenneth Calman  
Chief Medical Officer

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## Cancer

- Multifactorial
- Long Latent Period
- Multi-Hit



## DIET AND CANCER Prevention

About one-third of all cancers estimated avoidable through diet

Doll R + Peto R 1981

Riboli E 1992

Willett W 1995

Increased Survivorship: Secondary prevention

## World Cancer Research Fund

Estimates<sup>1</sup> of cancer preventability by appropriate food, nutrition, physical activity, and body fatness in four countries<sup>2</sup>

	USA	UK	BRAZIL	CHINA
Mouth, pharynx, larynx	63	67	63	44
Oesophagus	69	75	60	44
Lung	36	33	36	38
Stomach	47	45	41	33
Pancreas	39	41	34	14
Gallbladder	21	16	10	6
Liver	15	17	6	6
Colorectum	45	43	37	17
Breast	38	42	28	20
Endometrium	70	56	52	34
Prostate	11	20	N/A <sup>1</sup>	N/A <sup>1</sup>
Kidney	24	19	13	8
Total for these cancers combined	34	39	30	27
Total for all cancers	24	26	19	20

Around one quarter of all cancers estimated avoidable through appropriate food, nutrition and physical activity

## Cancer - developed vs developing transition in time

**Developing** eg Asia, Africa

Mouth and pharynx Larynx

Oesophagus Stomach

Liver Cervix

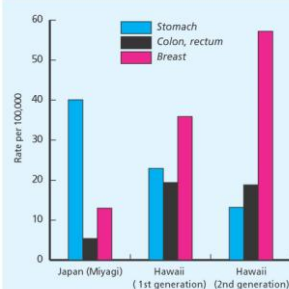
**Developed** eg Europe and US

Colorectal Breast

Endometrium Prostate

## Migration data

Figure 1.2.20 Cancer incidence for selected cancers in Japanese women by generation in Hawaii and Japan, 1968-1977



Toxic  
inflammatory  
Adiposity  
hormonal  
inflammatory

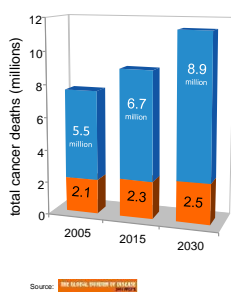
Phenotype  
body composition

Activity  
urbanisation

Fast food  
urbanisation  
deprivation

Smoking

## Deaths from cancers



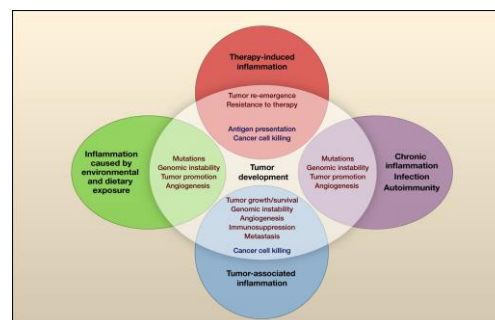
In all developing countries, cancers now account for a large enough share of **premature deaths** and poverty to merit an urgent and coordinated public policy response.

Source: WHO Global Cancer Observatory

Low- and middle income countries  
High-income countries

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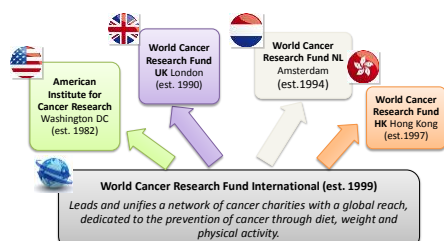
## Inflammation and Cancer



Grivennikov et al, Cell 2010;140:883-899

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## The World Cancer Research Fund Network





More detailed consideration cellular level interactions

obesity, energy, macronutrients

other nutrients, regulate and control processes

nature of processes

DNA stability and repair

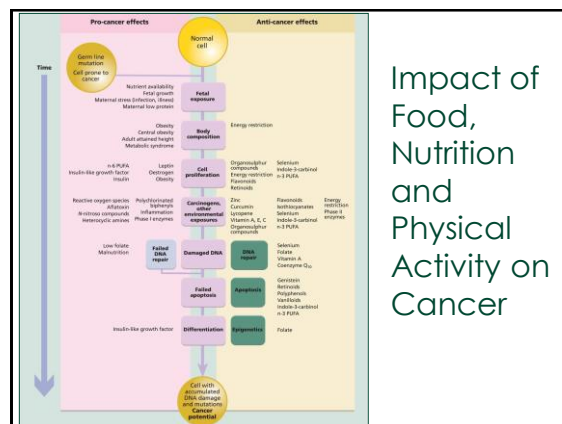
energy flux

inflammatory processes

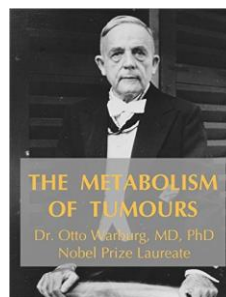
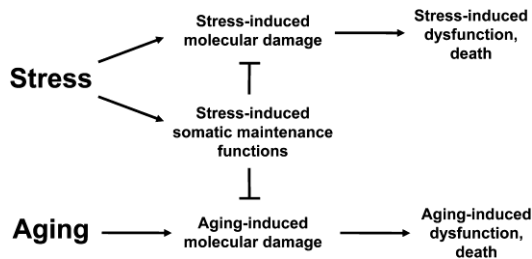
oxidative damage, redox state

regulation of cell cycle

control of microenvironment



Impact of  
Food,  
Nutrition  
and  
Physical  
Activity on  
Cancer



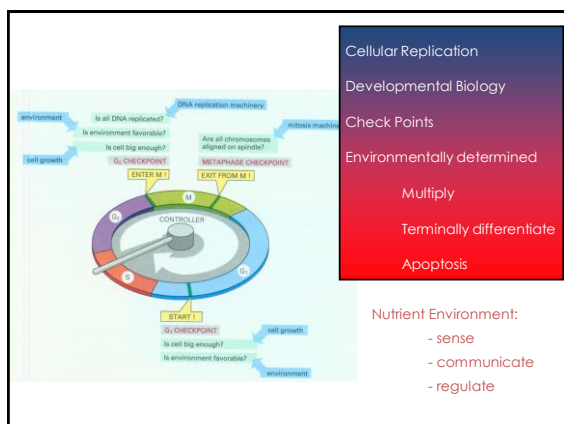
Nutrition: aerobic glycolysis

Infection,

Inflammation

Immunity

Cellular replication



Macrophage:  
Sense, communicate and respond  
to (nutrient) environment



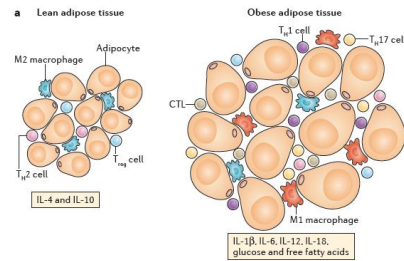
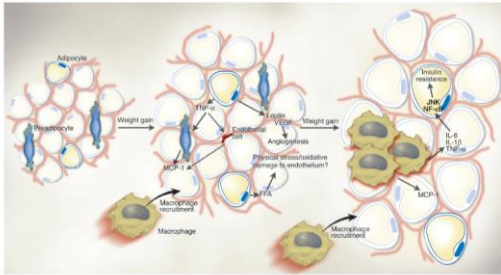
Infection/ inflammation

Immune surveillance

Anti-oxidant protection

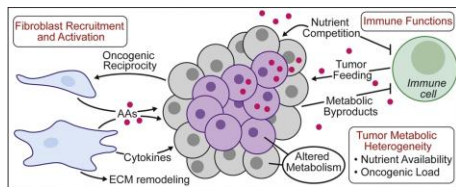
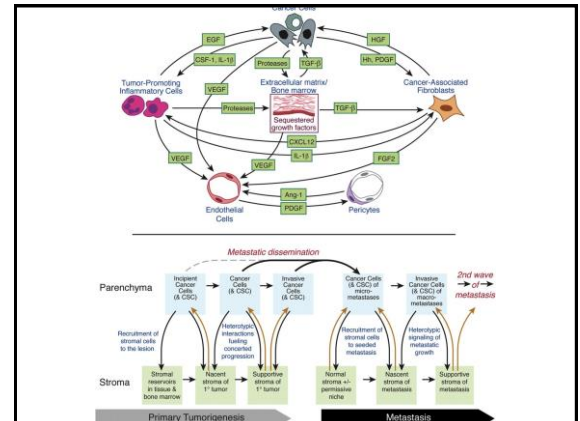
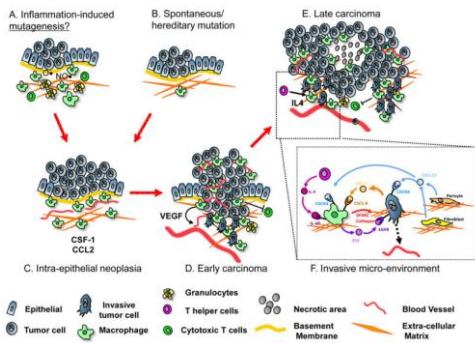
Pro-/ anti- apoptotic

### Tumour Microenvironment: Immune, inflammatory cells

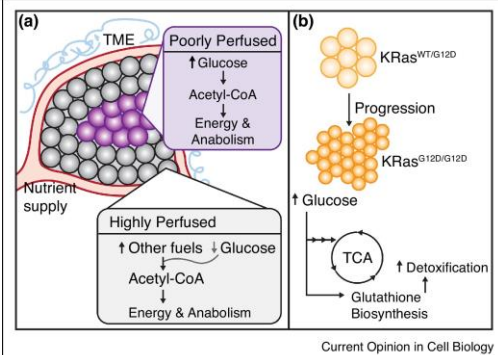


Bantug GR et al Nature Reviews: Immunology 2017

### Tumour Microenvironment Macrophages Promote Tumor Initiation, Progression, and Malignancy Qian & Pollard Cell 2010

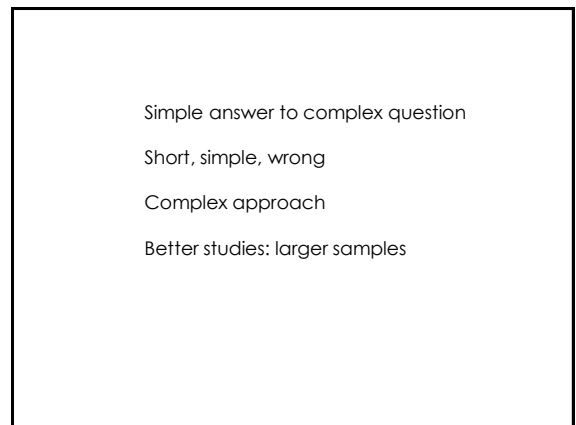
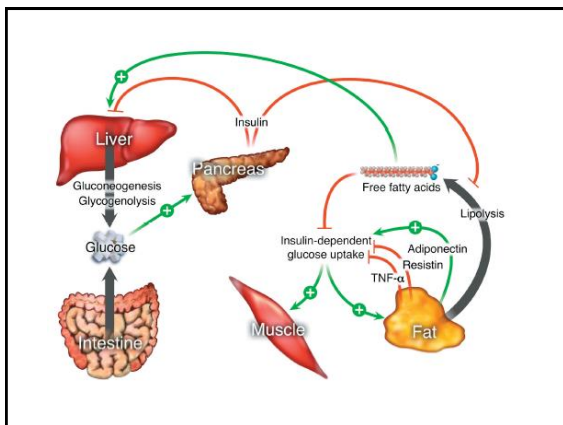
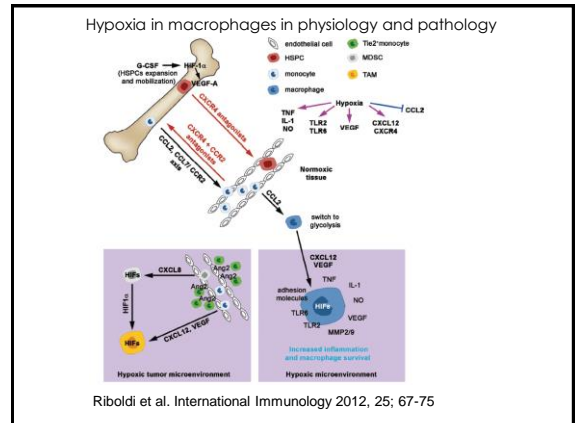
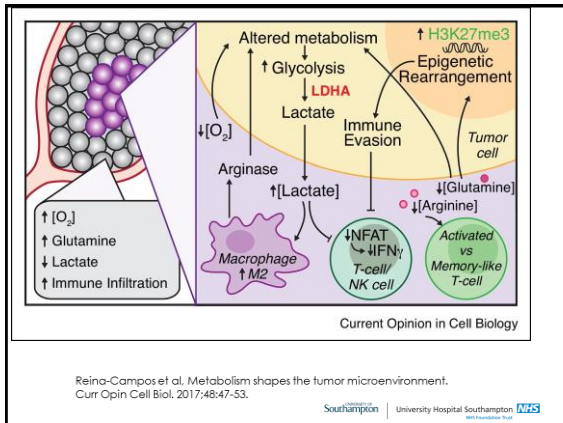
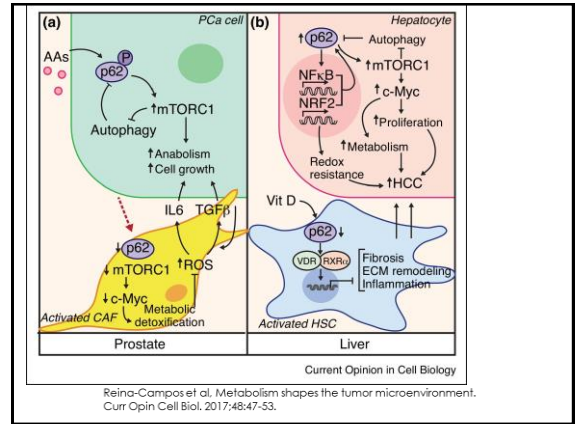
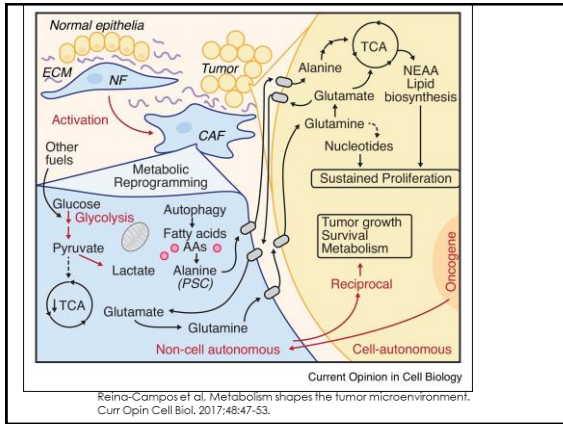


Reina-Campos et al, Metabolism shapes the tumor microenvironment.  
Curr Opin Cell Biol. 2017;48:47-53.

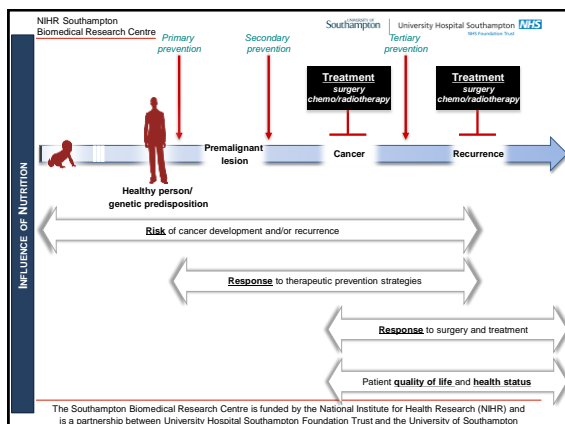


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Simple answer to complex question  
 Short, simple, wrong  
 Complex approach  
 Better studies: larger samples



Cancer cell:  
replication, differentiation, apoptosis

Tumour microenvironment:  
Macrophage, T-cell, myofibroblast, extracellular tissue

Tissue specific responses  
Tumour bearing  
Distant: liver, muscle

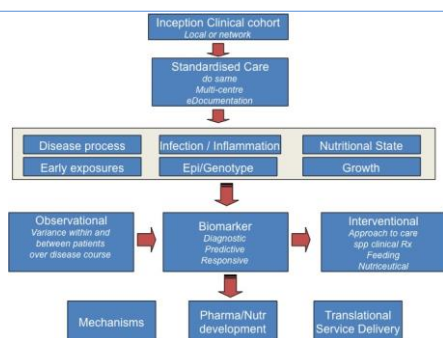
Biobanking: accessible specimenology  
Blood, serum, urine, stool, saliva, skin, hair etc

Size and shape, body composition.  
Whole body flux, integration and control

Behaviour: diet, lifestyle, physical activity, exercise.  
Past, present, future

Wider environment: social context, policy and programmes

### Inception cohorts - collaborative



Measurement:

quality assured

Standardised methodology

Competent people

Appropriate, agreed conceptual framework

### Cancer:

loss of ability to sense, regulate  
and control nutritional environment

molecular/ cellular

whole body

society

Interdependent

Nutritionist:

- Learn how to speak with patient in their own terms

-Learn to speak with other basic scientists in their own terms

-Learn to speak with each other in relation to developing and delivering service of value: to the patients and to themselves

-Organise their science to be meaningful

-Secure nutritional diagnosis

-FAQ: what do we know with confidence, what do we need to find out, how can we go about it – together.

