Introducing microarray

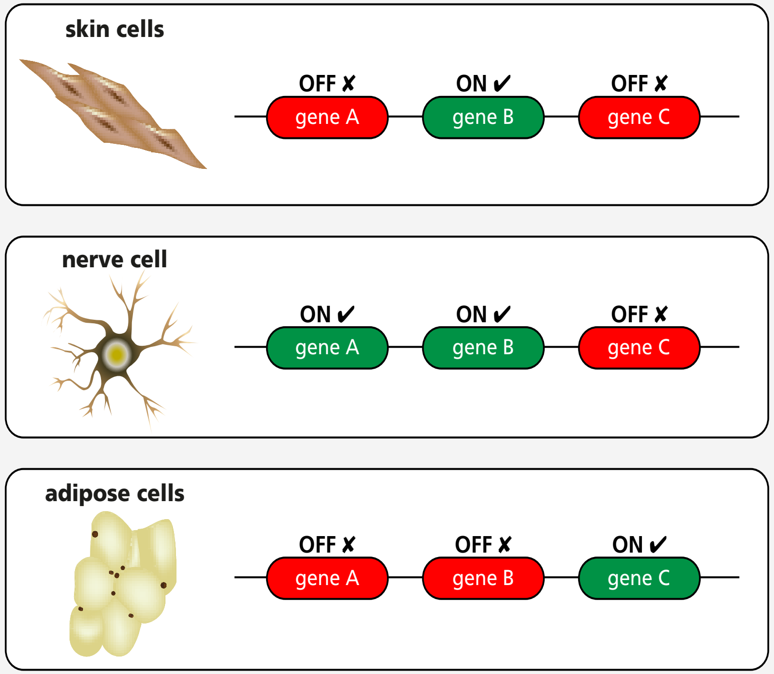
spice
secondary teachers' enrichment program

THE UNIVERSITY OF WESTERN AUSTRALIA
Achieving International Excellence

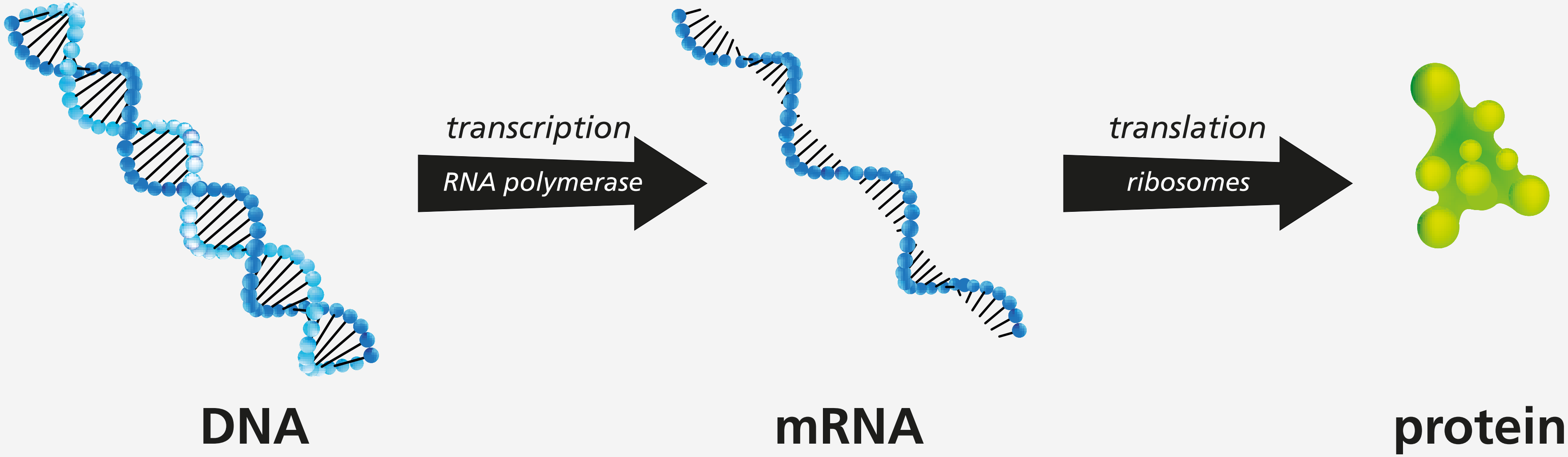
Government of **Western Australia**
Department of **Education**

Gene expression

- There are many different cell types, but every cell in our body contains the same genetic information.
- Why?
  Gene expression.



When are genes expressed?



DNA

transcription

RNA polymerase

mRNA

translation

ribosomes

protein

Measuring gene expression

Different techniques are used to measure gene expression, such as:

- northern blotting
- reverse transcription polymerase chain reaction (RT-PCR)
- microarray

Microarray and gene expression

- Microarray technology measures the amount of mRNA present in many samples at once.
- What genes are expressed and in what amounts?

Image courtesy of Affymetrix Inc

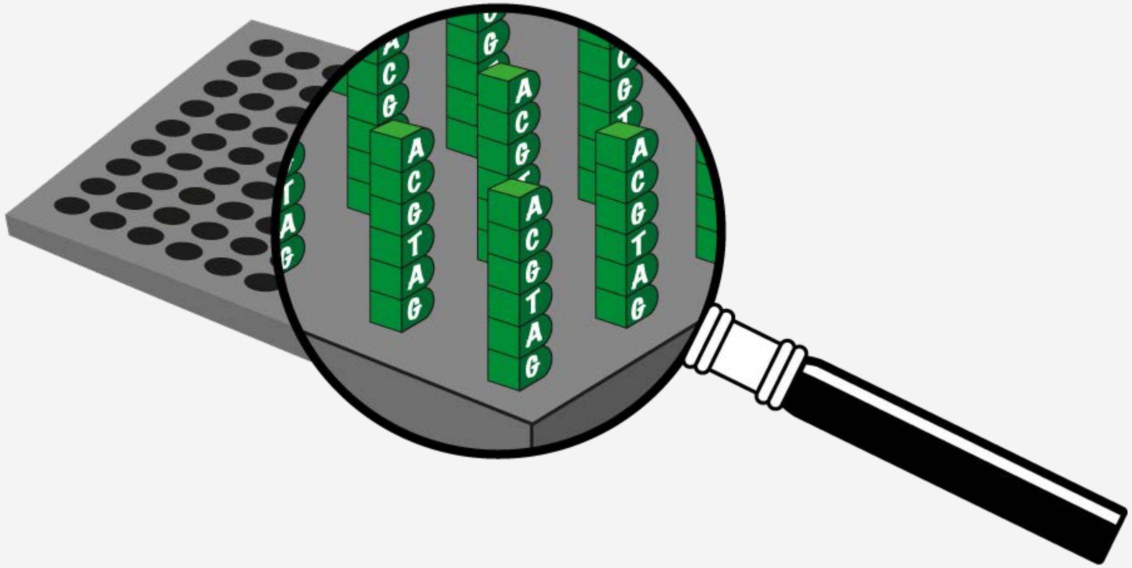
Microarray and cancer

Microarray is used to study cancer, enabling:

- classification of disease subtypes
- identification of genes that may be useful targets for personalised medical treatment
- selection of treatments suitable for individual patients

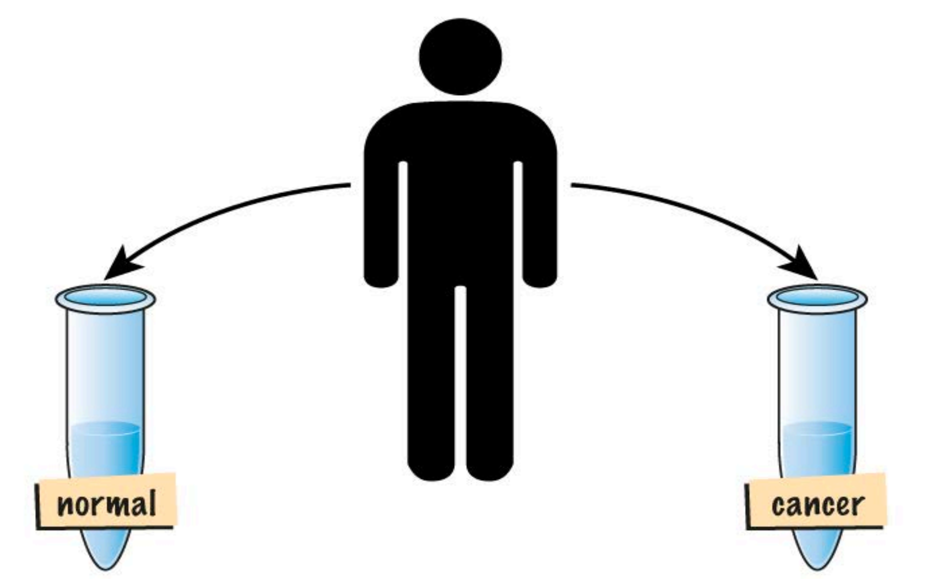
Step 1: Prepare microarray slide

A microarray slide is embedded with manufactured single-stranded DNA segments from known genes.



Step 2: Collect patient samples

Normal skin cells and melanoma cells are collected from each patient and mRNA isolated.

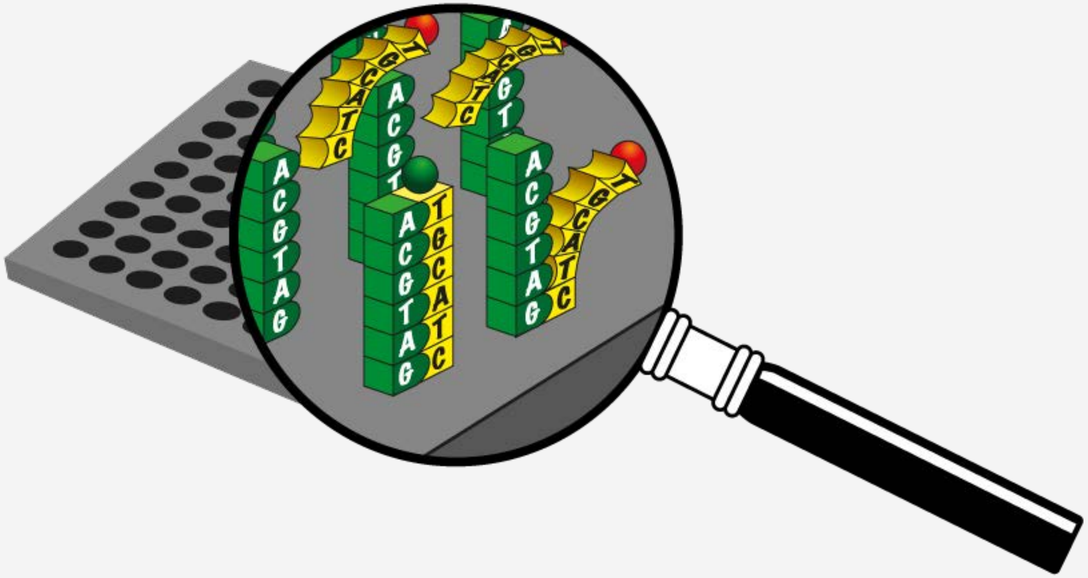


Step 3: Convert and label

- mRNA in patient samples is converted into cDNA.
- Samples are then labelled with fluorescent dye: normal skin cells with green dye, and melanoma cells with red. Once labelled, the two cDNA samples are mixed together.

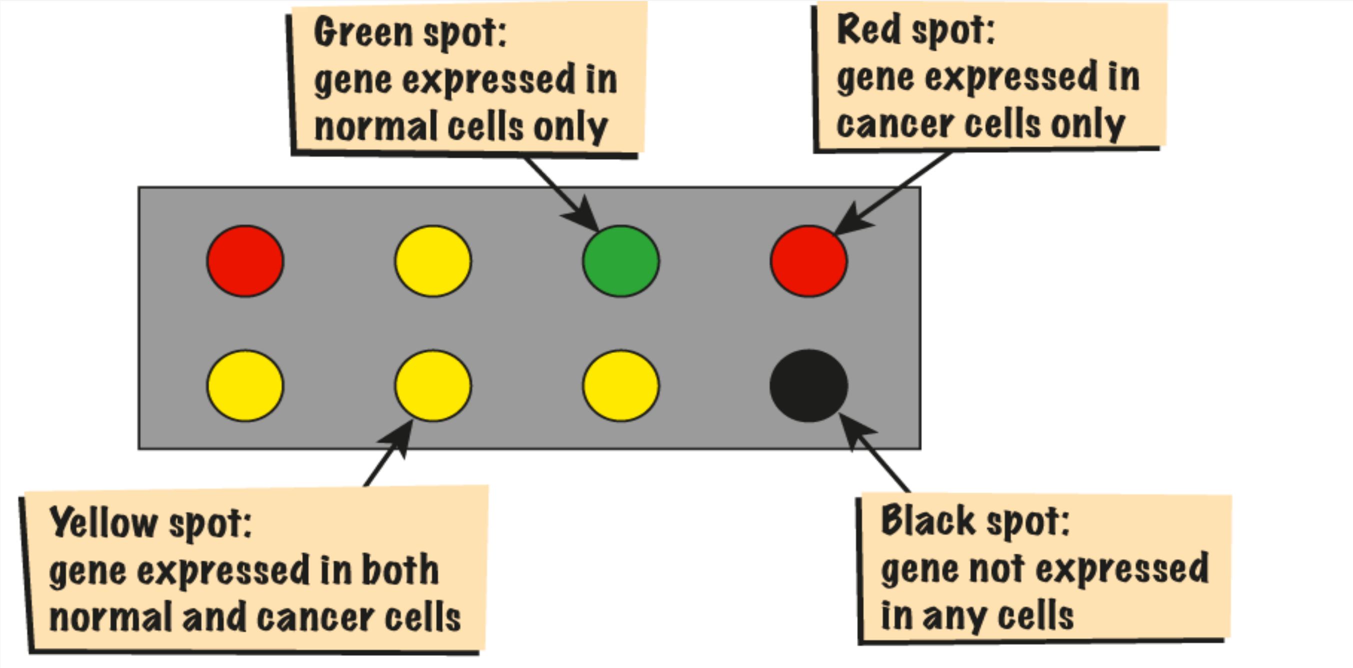
Step 4: Add cDNA to microarray slide

- cDNA will hybridise (bind) with complementary strands embedded on the microarray slide.



Step 5: Visualise microarray results

- Using laser microscopy the microarray slide is scanned revealing different coloured spots on the slide: red, green, yellow and black.



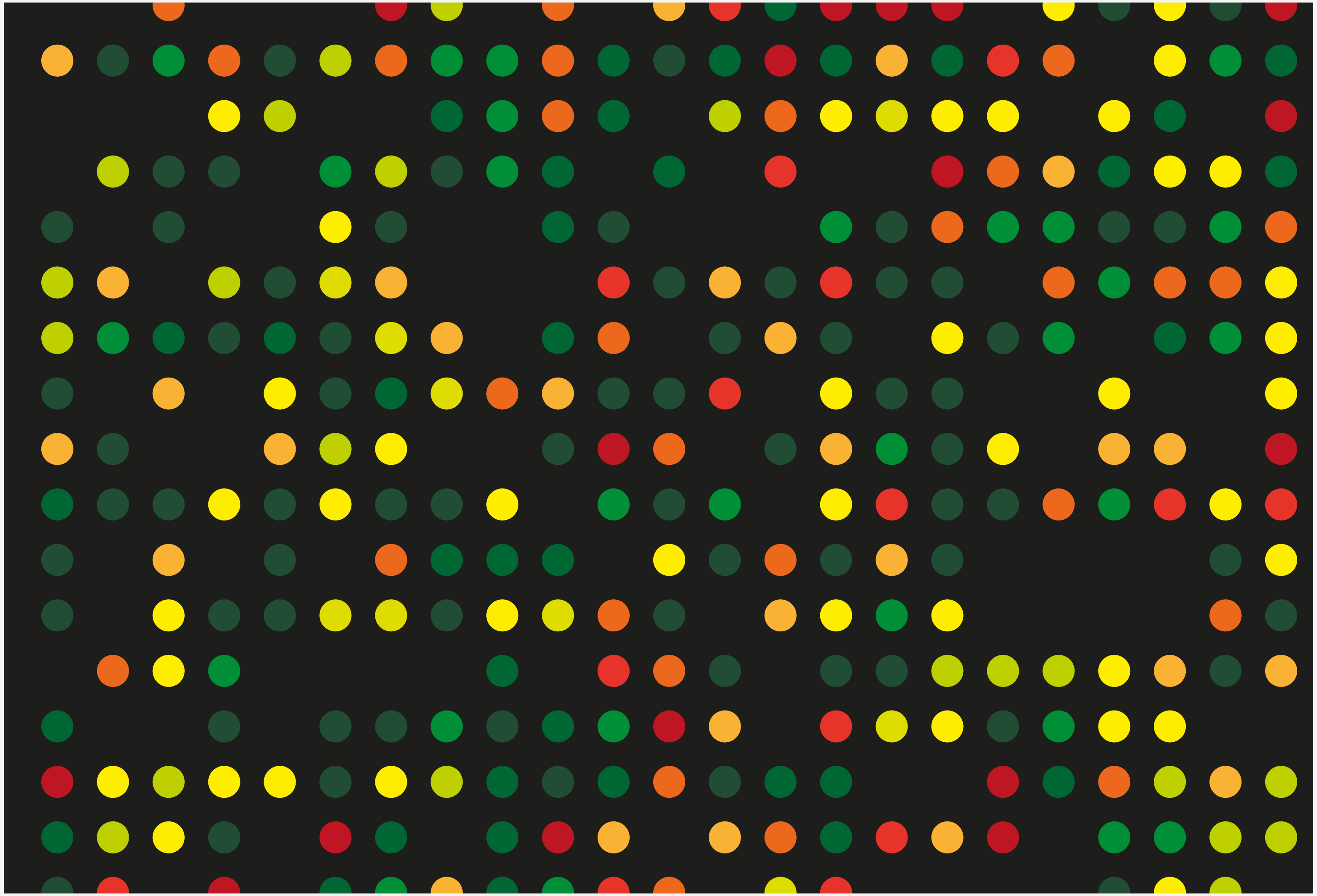
Green spot: gene expressed in normal cells only

Red spot: gene expressed in cancer cells only

Yellow spot: gene expressed in both normal and cancer cells

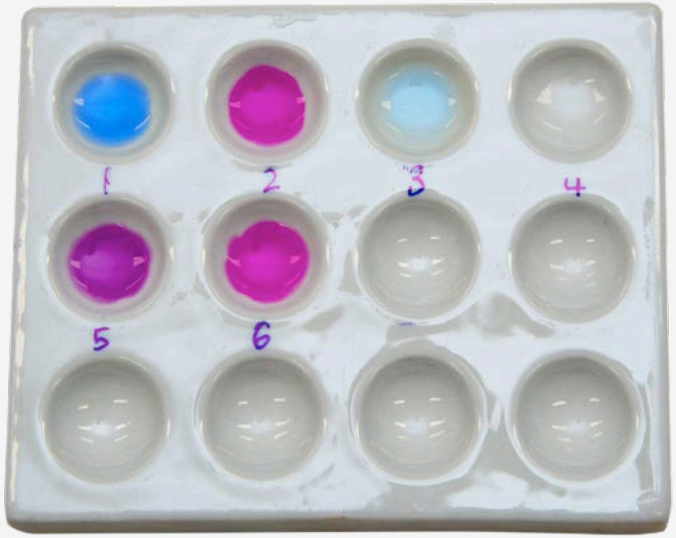
Black spot: gene not expressed in any cells

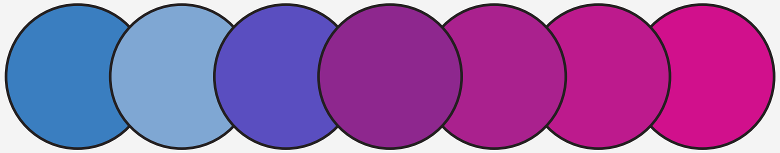
Interpreting microarray results



Microarray simulation

This simulation uses pH indicators to simulate microarray technique.





gene expressed more in normal cells

gene expressed equally in normal cells and cancer cells

gene expressed more in cancer cells

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Gene expression 3: Introducing microarray

Developed for the Department of Education, Western Australia