

Work Package 1: Transcriptomics

A new technology for the detection of food contaminants

The main goal of BioCop is the development of fast and cost-effective technologies for the screening of food contaminants.

Work package 1 will contribute to this goal by developing a high-throughput system for the screening of food samples through the exploitation of contaminant-specific transcriptional profiles.

When subjected to toxic stimuli, cells react by changing their protein expression patterns. In recent years it has been observed that different kinds of cellular stress generate distinct 'alarm' responses.

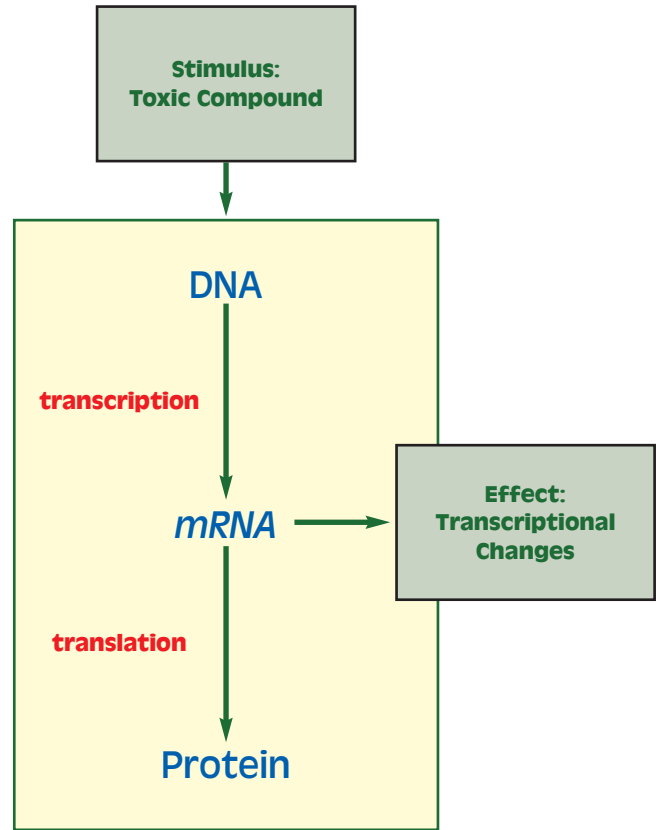


Figure 2: Molecular biology dogma and transcriptomics

Transcriptomics uses DNA microarrays to study these responses, at the level of the messenger RNA precursors of proteins, i.e. at the level of RNA transcripts. The use of high-density DNA microarrays allows the analysis of genome-wide transcription activity in a single experiment.

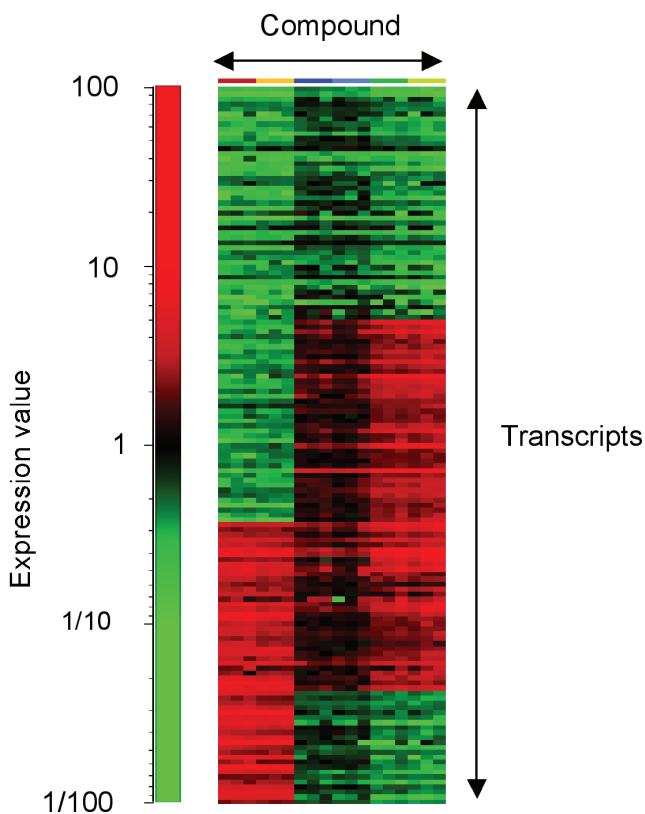


Figure 1: Expression of transcripts after treatment with different chemicals. Different compounds induce the expression of particular and different transcripts.

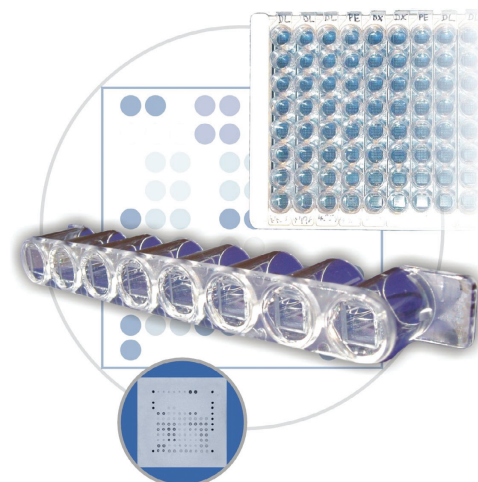


Figure 3: Tailor-made microarray in a high throughput format (96-well)



During the BioCop project, specific transcriptional 'alarm' responses to phytoestrogens (oestrogen-like compounds of plant origin), mycotoxins (toxic metabolites produced by fungi) and organochlorine pesticides, will be identified. These three groups of contaminants are commonly found in foodstuffs and therefore represent a hazard to human health. Once specific transcriptional patterns have been identified, a novel high-throughput platform will be developed for the low-cost screening of these compounds.

Four compounds have been selected for each group of contaminants included in this study:

Contaminant Group	Compound
Phytoestrogens (Compounds with oestrogen-like activity present in plants)	Daidzein (an isoflavone)
	Coumestrol (a coumestan)
	Resveratrol (a natural stilbene)
	Enterolactone (a lignan)
Trichothecene mycotoxins (Fungal toxins)	T2 toxin
	HT2 toxin
	Nivalenol (NIV)
	Deoxynivalenol (DON, also called vomitoxin)
Organochlorine pesticides (Pesticides commonly used for crop protection)	Dieldrin
	Endrin
	Nitrofen
	Hexachlorobenzene

For each of these 12 compounds, genome-wide transcriptional profiles or 'fingerprints' will be obtained in suitable human cell lines. The most prominent transcripts will be selected and used to create low-cost DNA chips for high-throughput screening. One of the main features of this method is that it will allow us to detect the cumulative effect of multiple food contaminants on individual biological pathways.

Work Package Progress in the first year

So far, DNA microarrays have been used to assess genome-wide transcriptional fingerprints. These fingerprints are characteristic of the response of human cells to phytoestrogens and trichothecenes. Transcriptional profiles resulting from exposure to organochlorine pesticides are currently under investigation.

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