Occupational Health Clinics for Ontario Workers

Centre de santé des travailleurs et travailleuses de l'Ontario

"Annual Check-up"
MOL / OHCOW

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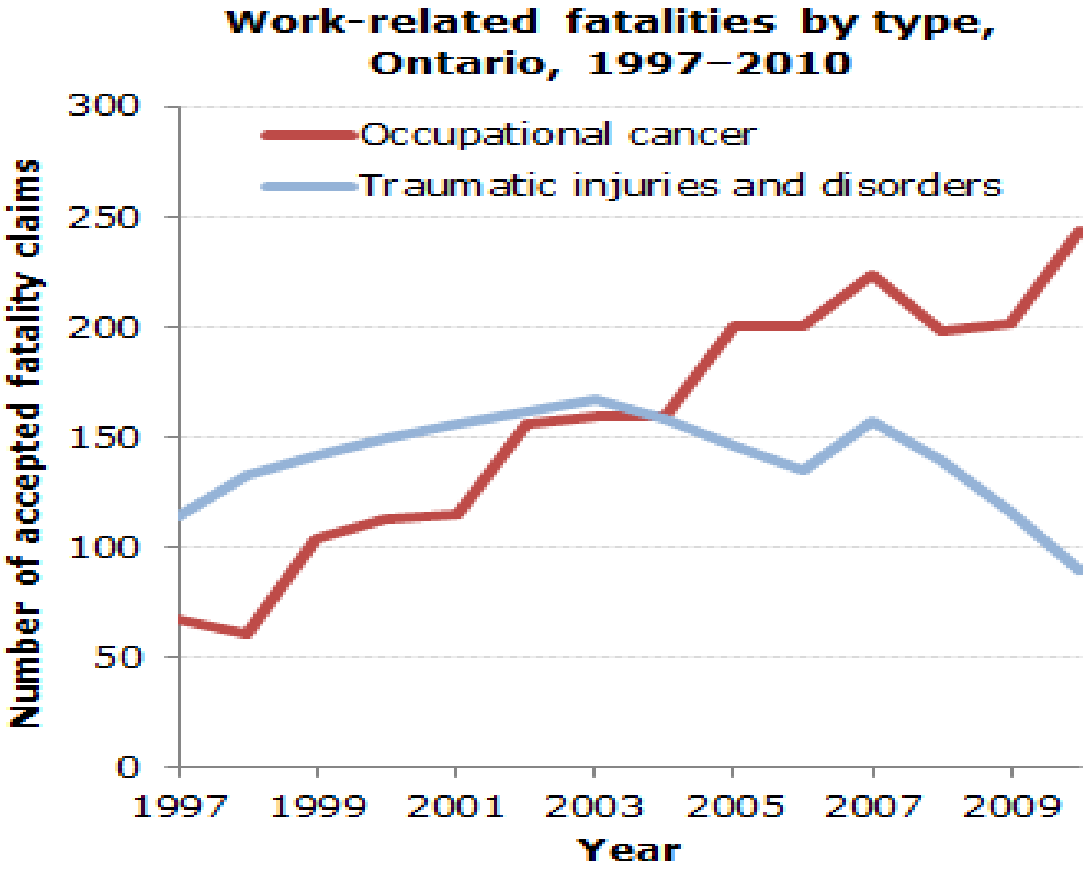
Occupational Medical Consultant to OHCOW

October 14, 2015

'Work-related fatalities by type' Ontario, 1997–2010'.



Source: Association of Workers' Compensation Boards of Canada (AWCBC) National Work Injury, Disease and Fatality Statistics 1997–2010.

OHCOW is at the Coalface

Chronic Disease Causation

"Current evidence suggests that non-genetic factors contribute about **90%** of the risks of chronic diseases, we have not explored the vast majority of human exposures that might initiate disease processes" (Lichtenstein 2000, Rappaport 2011).

Toxic chemicals enter the body not only from:

- exogenous sources (air, water, diet, drugs, and radiation)

but also from:

- endogenous processes, including inflammation, lipid peroxidation, oxidative stress, existing diseases, infections, and gut flora.

The Present

- Limited historical and present worker exposure data!
- Timely & Accurate Biological Testing

How do we get it?

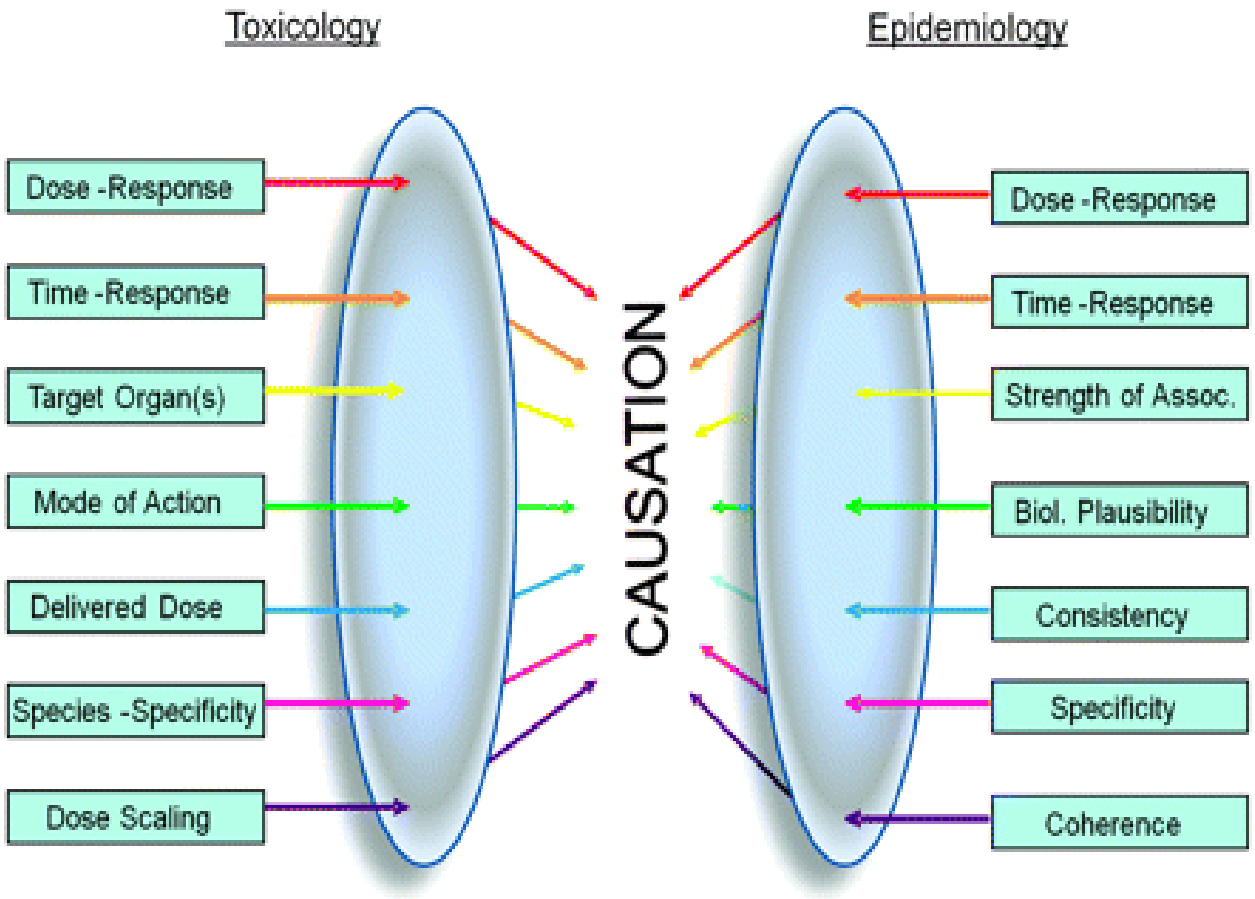
Multiple Chemical Mixtures

Multiple chemical exposures can have additive, if not multiple or synergistic, effects one on the other.

NIOSH - 2004

EU - 2009

Toxicology .v. Epidemiology

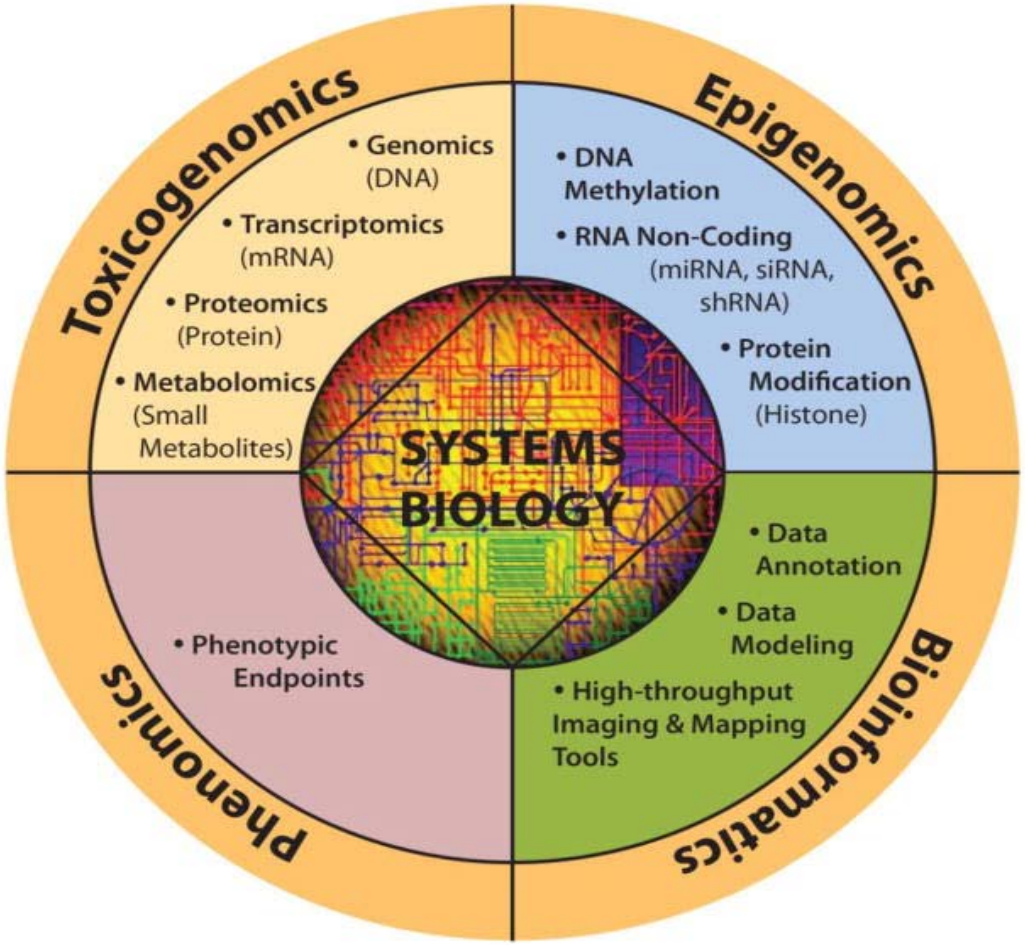


Hans-Olov Adami et al., 2011

Bio Markers - Definition

WHO and the ILO has defined a biomarker as “any substance, structure, or process that can be measured in the body or its products and influence or predict the incidence of outcome or disease” (2001).

Overview of systems biology and its components



Systems Biology

- Systems biology is a recent and evolving interdisciplinary field that focuses on the systematic study of complex interactions in biological systems.
- Employs a holistic approach to study all components and interactions in the network of DNA (genes), RNA, proteins and biochemical reactions within a cell or organism

McHale et al.,2010

Benzene – Low Dose Exposures

S Kim, et al., (2006) found benzene exposure levels at less than 1 ppm favored the production of:

- Hydroquinone (HQ) and
- E, E-muconic acid (MA)

Both considered to be extremely reactive and likely the most serious toxic metabolites of benzene metabolism.

Benzene – Low Dose Effects

McHale C, et al (2010), demonstrated changes in 16 specific genes that are "equivalent to fingerprinting" with respect to cell damage from prior benzene exposure at levels below 1 ppm of benzene.

Mounting Evidence for **Low** Dose Benzene Human Effects:

- R.B. Hayes, et al, 1997 (updated 2014),
- Luoping Zhang, et al, (2011)
- McHale C, et al (2010)
- Sung Kyoon Kim, et al, (2006)
- Qing Lan, et al, (2004)
- Mehlman 2004, Brachbar, 2006, Baan et al., 2009, IARC 2010, Straif. K. 2013).
- Etc, etc.

Biological Markers (Biomarkers)

Our contribution to identification and hopefully prevention of chronic diseases in the future.

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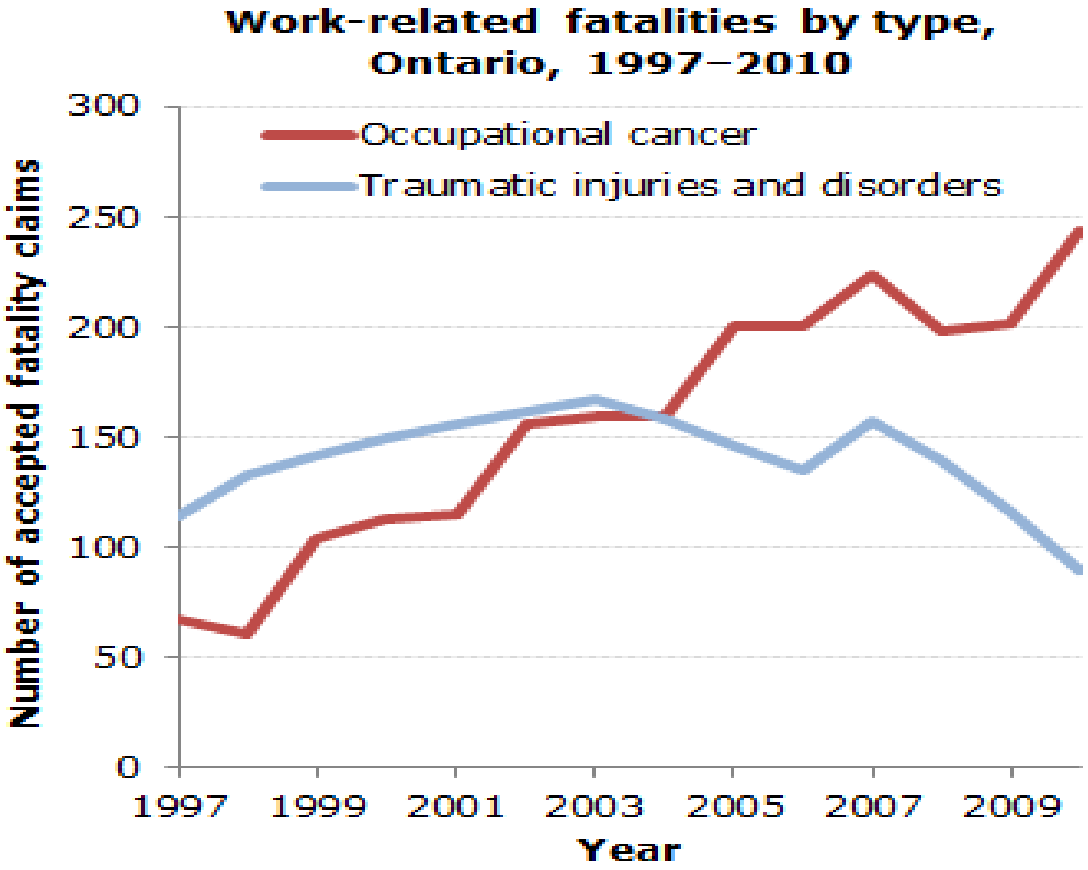

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“Annual Check-up” 2015

The “Check Up” Poses a Huge Challenge!

Thank you – Noel Kerin