

**THE UNIVERSITY OF ALBERTA**

**Department of Mathematical and Statistical Sciences**

# **Special Talk**

**“Mathematical Modeling of Colon Carcinogenesis”**

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Seattle, Washington**

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CAB 657 @ 3:00 p.m.**

## **Abstract:**

Carcinogenesis is the transformation of normal cells into cancer cells. This process has been shown to be of a multistage nature, with stem cells that go through a series of (stochastic) genetic changes that eventually lead them to malignancy. In this talk, I will present a mathematical model of colorectal carcinogenesis and discuss some of applications.

Careful mathematical analysis shows that the age-specific incidence of cancer predicted by the model exhibits 'phases' that reflect different aspects of the carcinogenesis process. In particular, calibration of the model to colorectal cancer (CRC) data in the SEER registry makes it evident that the age-specific incidence increases exponentially until about age 60 and does it linearly afterwards. The exponential phase reflects events between the formation (initiation) of adenomas (the pre-malignant lesions associated with the large majority of CRC) and the clinical detection of a malignant tumor, while the linear phase reflects the incidence (onset) of adenomas in the population. These results contradict the long-held view that the cancer age-specific incidence increases as a power of age.

Our model allows us to interpret differences in the age-specific incidence between populations in terms of differences in the underlying biological processes. As an example, we compare the CRC age-specific incidence by gender and CRC site (proximal colon, distal colon and rectum) and discuss plausible gender and site differences in adenoma prevalence and cell proliferation rates suggested by the model.