On risk assessment in cancer research, especially for nephroblastoma

Milan Stehl*
Departamento de Matematica, Universidad Tecnica Federico Santa Marta, Valparaiso, Chile
Department of Applied Statistics, Johannes Kepler University in Linz, Austria
Milan.Stehlik@jku.at

Nephroblastoma (Wilms tumour) is the typical tumour of the kidneys appearing in childhood. When we consider fractal based cancer diagnostic, many times a statistical procedure to assess the fractal dimension is needed. We shall look for some analytical tools for discrimination between cancer and healthy ranges of fractal dimensions of tissues. Recently, Baish and Jain (2000) discussed planar tissue preparations in mice which has a remarkably consistent scaling exponents (fractal dimensions) for tumor vasculature even among tumor lines that have quite different vascular densities and growth characteristics. In Hermann et al. (2015) we provided an extensive study of cancer risk assessment on simulated and real data and fractal based cancer. Both non-random and random carpets are modelling the cancer growth. On the other hand, in previous investigations, it has been shown that the texture of mammary tissue, as seen at low magnification, may be characterized quantitatively in terms of stereology (see Mattfeldt (2003) and references therein).

In the talk we will address some important inverse problems related to extreme process estimation and scaling. Scaling may lead to a range of p-values and powers, which constitutes an inverse problem. Beside this non invasive techniques generally may produce inverse problems, e.g. estimating a Hausdor fractal dimension from boundary of examined tissue. During the talk we will discuss several issues which bring light into both fractal based cancer modelling and more general stochastic geometry models and their comparisons. The algebraic and topologic properties of cancer growth are available via appropriate set structure, e.g. bornology (see Solovyov et al. 2015), or topology (Stehlk et al. 2015).

Author acknowledge support of WTZ Project Nr. IN 11/2011 Thermal modelling of cancer and Proyecto Interno 2015, REGUL. MAT 12.15.33, Modelacion del crecimiento de tejidos con aplicaciones a la Investigacion del cancer.

Keywords: mammary cancer, Wilms tumor, discrimination, fractal, modelling, inverse problem