Study of Genome characteristics in the case of Lung cancer

Nano Mikaia

Ivane Javakhishvili Tbilisi State University,
Faculty of Exact and Natural Sciences,
Department of Biology, Division of Genetics.
E-mail: miqaianano@gmail.com

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Scientific Managers:
Professor Teimuraz Lezhava;
Professor Rezo Gagua

Cancer is one of the leading causes of morbidity and mortality in the world. According to World Health Organization data, the current level of death caused by cancer, which is about 8.2 million in the world, will increase by more than 13 million before 2030 (1). Lung cancer (both small cell and non-small cell) is the second most common cancer in both men and women (not counting skin cancer). In men, prostate cancer is more common, while in women breast cancer is more common. About 14% of all new cancers are lung cancers (2).

Research relevance: genetic studies in Lung cancer are first made in Georgia.

Research purpose was to study genetic changes in Georgian individuals with lung cancer.

Research objectives:

- Study the activity of ribosomal cistrones;
- Determine the level of mutations of the chromosomes (aberrations, aneuploidy, polyploidy, early chromatid segregation (ECS), fragile sites);
- Measure the frequency of acrocentric chromosomes and ribosomal cistrones

Study material: Vein blood serum and the cells of stimulated peripheral blood lymphocytes from lung cancer patients.

Research methods:

- Lymphocytes cultivation method;
- Recording of structural (aberrations) and quantitative (ECS, aneuploidy, polyploidy) disorders of chromosomes
- G-banding method of differential staining (Ikaros's karyotripping system)
- Acrocentric chromosomes nucleolus-forming sites Ag-banding method.

The results show that in cells of lung cancer patients statistically significant was increased the structural (aberrations) and quantitative (ECS, aneuploidy, polyploidy) disorders of chromosomes compared to the control group. We have found high frequency of structural disorder cells (patient–5,9±1,0; control–1.7±0.3) in patients with lung cancer. In addition, the number of aberrations is also increased in one cell (patient–0,11±0,01; control–0,017±0,005).

Fragile sites frequency and location was also identified. We found significant increased number of fragile sites containing cells in diseased pacients (patient–61,7±3,6; control–20±1,2). We have also identified specificity of fragile sites location at chromosome groups – increased at C chromosome group.

Ag-positive chromosomes amount and acrocentric chromosomes associative activity were studied to identify synthetic processes intensity. The intensity of 15 chromosome entering in associations in all patients with lung cancer was increased compared to the control group (patient–0,45±0,02; control–0,32±0,01). The frequency of Ag+ chromatids in patients with lung cancer is significantly increased (patient–56±0,9; control–20±0,8) and the frequency of 2-point Ag+ chromatids is reduced compared to the control data.

In lymphocyte culture cells of patients with Lung cancer, we can conclude:

- Increased chromosomes aberrations and polyploidy frequency. In the 58% of male patients the aneuploidy was induced by the lost of Y chromosomes;
- Increased fragile sites frequency, while the frequency of medial fragile sites was decreased;
- the frequency of acrocentric chromosomes is relatively higher than in control group that is indicating the increase of transcriptional activity of ribosomal genes.
- The intensityof 15 chromosome entering in associations in all patients with lung cancer was increased compared to the control group.
- The frequency of Ag+ chromatids in patients with lung cancer is significantly increased and the frequency of 2-point Ag+ chromatids is reduced compared to the control data.

Reference:

- Cancer Statistic Centre 2016
- Key Statistics for Lung Cancer. American cancer society. National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention, 2016.