Podcast: Clinical Laboratory Geneticist - Health Care Professions in Breast Cancer Treatment and Care

[opening music]

Jaana Hoffren: Welcome to Health Care Professions in Breast Cancer Treatment and Care Podcast. This podcast is produced in EBreast II project. Breast cancer is the women's most common cancer and what makes it complex is that there are many effective factors behind it, as the hereditary environment and the risks of way of life and coincidence. Today we meet at this podcast interview PhD Marja-Leena Väisänen. She is working as a clinical laboratory geneticist at the laboratory of clinical genetics NordLab Oulu. We are interested at this Ebreast II project in breast cancer diagnostics and how the findings are affecting breast cancer treatment. At this podcast interview we are concentrating on hereditary breast cancer and it's the same as familial breast cancer.

[music jingle]

Jaana: I warmly welcome to this podcast interview Marja-Leena Väisänen. Welcome.

Marja-Leena Väisänen: Thank you for inviting me here.

Jaana: Can you tell us shortly about your education and background?

Marja-Leena: My educational background is biologist. I started the biology studies in Oulu University and from the very beginning I knew I want to specialize to genetics and especially to medical genetics. That's why I applied to do my graduate work of Master's degree to the Oulu University Hospital Department of Clinical Genetics and the Laboratory of Genetics. After master's degree I continued the research with the same topic as was my graduate work and finally finished my PhD in the Medical faculty. At the same time when I was preparing my PhD I started to specialize to Clinical Laboratory Geneticist also called Hospital geneticist at that time. It is a training program producing specialists for working in daily managerial work for the genetic labs. The training consists of four year on-site laboratory training in addition to the theoretical studies and a final exam. The program covers molecular genetic and cytogenetic processes and all aspects required for working as a geneticist in a clinical lab. Passing this Finnish training program also qualifies for working in other European countries. During the training and after that I have worked as a Clinical Laboratory Geneticist in Oulu except one year visit in Kuopio University Hospital Genetic Lab.

Jaana: Marja-Leena, can you tell us about your typical workday?

Marja-Leena: Yes. The tasks of my typical workday varies quite a lot, but usually it consists of int**e**rpretation and reporting of the results of different gene tests. Some tests produce unambiguous and easy to report results, but sometimes the interpretation requires profound exploring of the literature and the use of numerous medical and genetic databases. This is the most interesting and time consuming in my work and it is always rewarding when you find the cause of patient's clinical symptoms. The urgent patient cases for example prenatal diagnostic cases are always analyzed and reported immediately, as soon as possible. In addition, the problem solving in laboratory processes and implementation and validation of new methods and assays belong to my workday although not being everyday tasks.

Jaana: Please tell us about interprofessional cooperation in clinical genetics.

Marja-Leena: In the clinical laboratory we work together and be in contact with several different professionals. In the everyday work the coworkers are Biomedical laboratory scientists who are highly specialized and trained to diagnostic genetic laboratory methods. We have regular monthly meetings with the clinicians of Clinical genetics department and with genetic nurses I communicate almost daily. Collaboration with clinicians of other specialities is common too, also with clinicians from other hospitals as we receive samples to certain analysis all over the country, not only from Oulu or Northern Finland region. Then of course I have contacts with colleagues in other genetic labs and in Finland we have Finnish society of clinical laboratory genetics in healthcare and Finnish society of medical genetics which organize meetings twice a year with scientific and educational program where you can meet and discuss with colleagues. Communication between different professionals participating to the clinical pathway of breast cancer patients is essential. I must also mention the collaboration with the Hereditary Breast Cancer research group which has been very important and fruitful. The breast cancer research group and genetic lab were previously working physically in the same laboratory facilities, but now for many years the research group has been in Biocenter. However the connections have maintained which has been an advantage in implementing the new clinically important findings to routine diagnostics fluently and without delay.

Jaana: Can you tell us about breast cancer samples and diagnostic process?

Marja-Leena: Well the gene tests in breast cancer diagnostics are currently done by widely used Next Generation Sequencing (NGS) Techniques. In Next Generation Sequencing method the targeted pattern of genes or even the whole exome which means all coding regions of the human genome are fragmented and millions of short fragments are amplified and enriched simultaneously in a multi-step reaction. This is called sequencing library preparation. These library DNA samples are barcoded or indexed so that individual samples can be identified after pooling together and sequencing in a one reaction in Next Generation Sequencing machine. The huge amount of raw data is then aligned to reference sequence and compared and several open-source or commercial genome assembly and annotation software are available for further analyze the data and help in finding the clinically important sequence variants which are the mutations.

The breast cancer samples for our laboratory come mainly from outpatient clinic of Clinical Genetics in Oulu University Hospital. Usually the patients visit the doctor who evaluates their risk for hereditary breast cancer and offers genetic counseling already before genetic testing. Of course they get genetic counseling after test results too. The patients fulfill the high risk criteria if there is several close relatives known to have breast, ovarian or certain other cancers, for example colon cancer. And also the onset of breast cancer in young age puts a person in the high risk category. The test is called diagnostic when a patient already has the cancer or predictive if a person is healthy but wants to know if she or he is a carrier of cancer predisposing mutation. So in public healthcare the genetic testing for breast cancer is not a screening test for anyone who wants to know the personal risk.

The testing process starts with the DNA extraction from the samples, usually blood samples but sometimes paraffin embedded tissue samples from already deceased relatives are needed. The sequencing libraries, which is the wet laboratory work, are done by Biomedical laboratory scientists in our laboratory and then the sequencing is done in Illumina NextSeq device in Oulu

University Biocenter sequencing core and finally Clinical Laboratory Geneticist performs the interpretation of the data obtained from the analysis softwares.

Our breast and ovarian cancer assay is a gene panel consisting of 29 predisposing genes. In addition to well known breast cancer high risk genes BRCA1 and 2 and PALB2, several moderate and smaller risk genes are included. But if the patient wants to know only results of the high risk genes, that is possible by modifying the analysis panel. In that case we analyze only those genes which are asked.

Jaana: Can you tell us more about the prices of the gene tests?

Marja-Leena: The prices have come down in recent years and in targeted gene panels they are about 1000 euros presently in most places which are performing these analysis.

Jaana: Please tell us about individual treatments.

Marja-Leena: The genetic testing of Breast cancer allows personalized risk assessment and can lead to disease preventive actions. For the breast cancer patient the identification of a germline pathogenic gene variant not only explains the likely cause of the cancer, but certain variants can also influence to therapeutic choises and specify the individual treatment. In addition, the knowledge of the familial mutation enable predictive testing of other family members, for example children, who might be at risk of inheriting the same variant. This makes possible the efficient and regular clinical follow up and monitoring in order to find the first signs of cancer early enough. Sometimes finding of the familial high risk mutation may even lead to mastectomy.

Jaana: What guidelines and regulations do you follow in clinical genetics laboratory?

Marja-Leena: Well as a clinical accredited lab we participate to external quality control rounds, which are organized annually for clinical genetic tests and also technical rounds for common diagnostic methods used in genetic laboratories. In addition of course we follow the best practice guidelines produced by the international organizations such as European Molecular Genetics Quality Network (EMQN) for molecular genetics and European Cytogenetics Association (ECA) for cytogenetics. In addition the instructions of American College of Medical Genetics (ACMG) concerning the gene variant pathogenicity classification are the golden standard in the present era of Next Generation Sequencing.

Jaana: How do you see the future in breast cancer diagnostics?

Marja-Leena: Well reality today is that only less than 20% of familial breast cancer can be explained by mutations in the presently known predisposing genes. Recently it has become more and more evident that polygenic predisposition plays important role in hereditary cancer. Polygenic predisposition means that a combination of several variants with small individual influence could markedly increase the risk of cancer development. This polygenic association and personalized risk assessment with more sophisticated analyzing methods of sequence data probably with the aid of artificial intelligence will surely improve diagnostics of hereditary breast and ovarian cancer in the future.

Jaana: Marja-Leena, do you have any message for the students?

Marja-Leena: Yes. The personalized medicine relying strongly to genetic data will definitely increase in the future which means that new specialists and professionals will be urgently needed in this field. So I think there will be a lot of working and career opportunities for persons who are interested in working either in a laboratory or in a clinic with genetic issues.

Jaana: Thank you for this interview. This was very powerful and interesting to get to know more about clinical genetics world.

Marja-Leena: Thank you.

[end music]

[end credits]

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