Chernobyl Tissue Bank Project: Pathology Review

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A large increase in thyroid carcinoma incidence among those exposed as children to the high levels of fallout from the nuclear accident at Chernobyl in 1986 has been reported. The Chernobyl Tissue Bank (CTB) was established in 1999, and it provides a diagnosis agreed by internationally recognized pathologists and an archive of material that can be used for current and future studies on radiation related thyroid cancer. The CTB is an internationally supported project, with funding provided by four sponsors (EC, NCI of the USA, SMHF, and WHO) and supported by the governments of Ukraine and Russia. A back-up copy of each of the computer databases is maintained at the Coordinating Center at the University of Wales, Swansea. The project ensures that appropriate ethical consent is obtained for each biological sample and that materials (frozen tissue, fixed tissue sections, extracted DNA/RNA and blood samples) are available for appropriate research studies. Up to date more over 2,500 cases have been registered, and the CTB holds DNA and RNA from more than 280 thyroid tumors from the patients younger than 19 at the time of the explosion. Information regarding applications for and the use of these materials is now available on the CTB website (www.chernobyltissuebank.com). Material from the CTB has been released to 16 projects to researchers in 7 countries.

Although over 95% of the cancers are classified as papillary carcinomas in the population around Chernobyl following exposure to fallout, they vary in their morphology, ranging from a solid immature phenotype, to well differentiated tumors dominated by either papillary or follicular architecture. Some of the early reports on the thyroid carcinomas around Chernobyl suggested that the solid morphology, aggressiveness, and the apparently high frequency of RET/PTC3 rearrangements were indicative of radiogenic tumors. However, recent studies have shown that the morphological pattern of papillary carcinomas is changing with increasing latency. We showed that short latency is associated with solid morphology and significantly more invasive spread when compared to tumors with a longer latent period. In contrast, the type of differentiation is associated with age at exposure. Many reports have suggested that RET/PTC3 rearrangements are associated with the solid morphology seen in short latency tumors, while well differentiated papillary carcinomas more often show RET/PTC1 rearrangements. The frequency of BRAF mutation is low in post Chernobyl thyroid cancer and is similar to that observed in other studies of childhood thyroid papillary carcinoma, and this may be related to the age of the patient at diagnosis. More recent study revealed that the unexposed group of tumors from Ukraine and Russia were essentially identical morphologically to the exposed tumors from the same area. The tumors from Japanese children were significantly different from the tumors from around Chernobyl, whether exposed or unexposed, showing significantly more differentiation, more papillary differentiation. One possibility deserving serious consideration is the iodine content of the diet.

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