2019 NPCR TEXAS SUCCESS STORY

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Multi-State, Population-Based Epidemiologic Study Identifies that Children with Birth Defects Have an Increased Risk of Certain Cancers

NATIONAL PROGRAM OF CANCER REGISTRIES SUCCESS STORY

SUMMARY: Although the causes of most major childhood cancers are unknown, research indicates cancer may be more frequent in children born with certain birth defects.1-5 To better understand cancer risk among children, a team of researchers at Baylor College of Medicine partnered with multiple state cancer registries, birth defects registries, and vital registration systems to evaluate the associations of birth defects and childhood cancers. This multi-state epidemiologic research study included data linkages with cancer incidence data, birth defects data, and birth records in Texas, Arkansas, Michigan, and North Carolina. For this study, the Texas Cancer Registry (TCR) included all records of children diagnosed with cancer at less than 18 years of age in the data linkages. Results showed an elevated risk of certain cancer types in children with chromosomal and nonchromosomal birth defects.

CHALLENGE: Childhood cancers are rare. Of all new cancers diagnosed, less than 1% are among children.6 There were 10,597 children under 15 years diagnosed with a new cancer in the United States in 2016,7 and the TCR estimates that 1,242 children will be diagnosed in Texas in 2019. Although the occurrence of cancer in children is rare, it is the second most common cause of death among children.6 The cause of most childhood cancers is unknown. However, being born with certain birth defects is a known risk factor. Nearly one in every 33 babies are born with birth defects in the United States each year8Like childhood cancer, often the cause of birth defects is unknown.

Studies have shown that individuals born with certain birth defects are at increased risk of developing cancer during childhood or adolescence.1-5 For example, being born with Down syndrome (trisomy 21) is associated with increased risk of developing leukemia.3 Associations between childhood cancers and birth defects involving chromosomal abnormalities are better understood than those involving nonchromosomal defects, although the latter affect more children. Due to the rarity of both birth defects and childhood cancers, research on associations between specific birth defects and specific childhood cancers has been limited by insufficient numbers of cases.

SOLUTION: A collaborative team of researchers at Baylor College of Medicine, in partnership with multiple state cancer registries, birth defects registries, and vital registration systems, set out to assess whether children with certain birth defects or those with more than one birth defect are more likely to develop specific childhood cancers. To achieve these aims, the researchers worked with multiple states, including Texas, Arkansas, Michigan, and North Carolina. The research was supported by the Cancer Prevention and Research Institute of Texas, National Cancer Institute, Arkansas Biosciences Institute, and Alex's Lemonade Stand Foundation. After researchers obtained the required approvals, including those from the Texas Department of State Health Services (DSHS) Institutional Review Board and Research Executive Steering Committee, the TCR collaborated with the DSHS Center for Health Statistics and DSHS Birth Defects Epidemiology and Surveillance Branch to link statewide data on cancer, births, and birth defects. Following the data linkages, the TCR provided de-identified linked data to the primary investigators at Baylor. Researchers then pooled the de-identified linked data from Texas with data from the other states. In total, the study examined data from over 10 million children under 18 years of age.

RESULTS: A recent publication in the JAMA Oncology reports on the study's findings.9 This study is thought to be the largest population-based study to date to examine associations between specific chromosomal and nonchromosomal birth defects and specific childhood cancers. Overall, researchers found an elevated risk of childhood cancer in children with birth defects. That means, children with chromosomal anomalies and nonchromosomal birth defects were more likely to be diagnosed with cancer during their childhood compared to children without birth defects. Compared to children without birth defects, children with chromosomal abnormalities were 11.6 times more likely to be diagnosed with any childhood cancer. Children with nonchromosomal birth defects were 2.5 times more likely to be diagnosed with any childhood cancer compared to those unaffected by birth defects.

When evaluated individually rather than as a whole, all chromosomal anomalies and single-gene disorders (trisomy 13, 18, 21 and Turner syndrome; tuberous sclerosis and neurofibromatosis) were associated with an increased risk of cancer. For example, children with Down's Syndrome (trisomy 21) were 14.7 times more likely to be diagnosed with cancer that children without any birth defect, and children with neurofibromatosis were more than 54.0 times more likely.

Researchers also found that as the number of nonchromosomal birth defects increased, so did the risk for cancer before age 18. Children with two birth defects were 3.5 times more likely to be diagnosed with cancer than children without a birth defect. Children with four or more birth defects were even more likely to be diagnosed with childhood cancer; they were 5.9 times more likely to be diagnosed with cancer than those unaffected by birth defects.

In addition, this study evaluated whether there were associations between specific cancer types and specific birth defects. Researchers found strong associations between 40 specific birth defects and specific childhood cancers. Five of the associations were among chromosomal anomalies or single-gene disorders. Some of the strongest associations were between astrocytoma and non-rhabdomyosarcoma soft-tissue sarcoma among children with neurofibromatosis. The remaining 35 associations found in this study were among nonchromosomal birth defects. Strongest associations were found for biliary atresia and non-Hodgkin lymphoma (164.2 times more likely), and spina bifida without anencephaly non-rhabdomyosarcoma soft tissue sarcomas (75.6 times more likely).

SUSTAINING SUCCESS: Cancer registries play a vital role in collecting, maintaining, and disseminating high quality cancer data to support research designed to help reduce the burden of cancer. The TCR will continue to support DSHS IRB-approved epidemiologic cancer research including those involving data linkages among multiple programs like the current study. Through collaboration, the TCR will work with the DSHS Center for Health Statistics and DSHS Birth Defects Epidemiology and Surveillance Branch to develop robust datasets for researchers examining cancer etiology and outcomes. Based on insights achieved, researchers at the Baylor College of Medicine and their partner organizations plan to conduct additional studies on associations between birth defects and childhood cancer. The TCR will support researchers, like the ones responsible for this novel research, by facilitating new data linkages with the most current data available.

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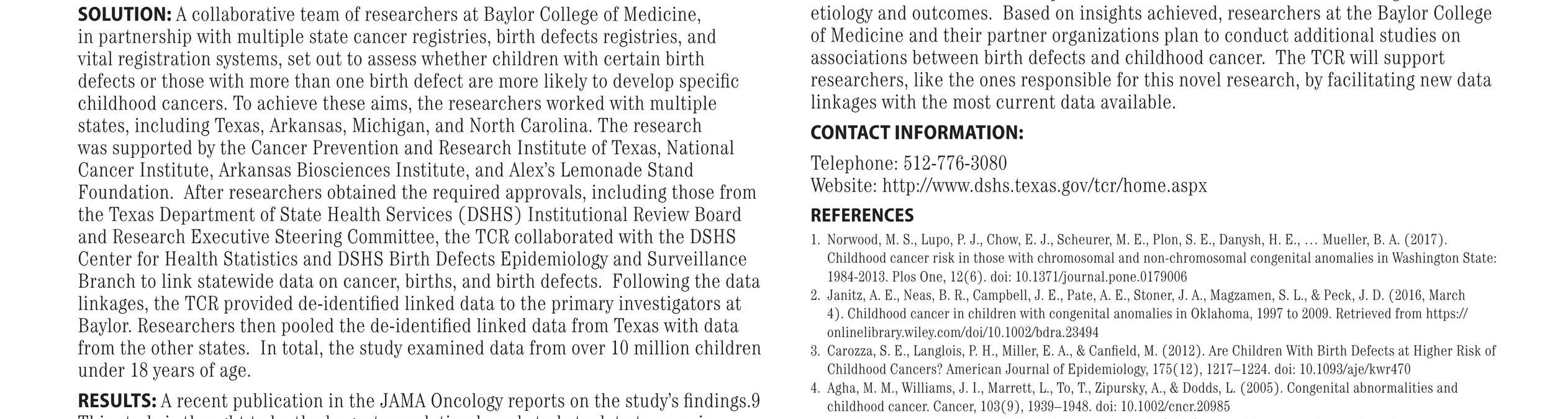

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