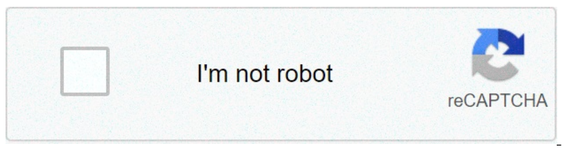

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Industrialization in the 19th century is most associated with

19th century UNITED KINGDOM In the early 1800s, Scottish physician John Waldrop proposed that “glioma of the retina,” which typically appeared within the eyes of newborns and young children and was usually lethal, might be cured via early removal of affected organs. 1829 FRANCE Gynecologist Joseph Recamier described the invasion of the bloodstream by cancer cells, coining the term metastasis, which came to mean the distant spread of cancer from its primary site to other places in the body. 1838 GERMANY Pathologist Johannes Müller demonstrated that cancer is made up of cells and not lymph. His student, Rudolph Virchow (1821–1902), later proposed that chronic inflammation—the site of a wound that never heals— was the cause of cancer. 1842 ITALY Domenico Antonio Rigoni-Stern undertook the first major statistical analysis of cancer incidence and mortality using 1760–1839 data from Verona. This showed that more women than men died from tumors, and that the most common female cancers were breast and uterine (each accounting for a third of total deaths). He found cancer death rates for both sexes were rising, and concluded that incidence of cancer increases with age, that cancer is found less in the country than in the city, and that unmarried people are more likely to contract the disease. 1845 UNITED KINGDOM John Hughes Bennett, the Edinburgh physician, was the first to describe leukemia as an excessive proliferation of blood cells. 1851 – 1971 UNITED KINGDOM Decennial reports linked cancer death to occupation and social class. 1880 Earlier invention of general anesthesia (chloroform, ether, nitrous oxide) became more wide- spread, making cancer surgery more acceptable. 1881 USA First practical cigarette-making machine patented by James Bonsack. It could produce 120,000 cigarettes a day, each machine doing the work of 48 people. Production costs plummeted, and— with the invention of the safety match a few decades later— cigarette smoking began its explosive growth. 1886 BRAZIL Hereditary basis for cancer first suggested after Professor Hilario de Gouvea of the Medical School in Rio de Janeiro reported a family with increased susceptibility to retinoblastoma. 1890s USA Professor William Stewart Halsted at Johns Hopkins University developed the radical mastectomy for breast cancer, removing breast, underlying muscles, and lymph nodes under the arm. 1895 GERMANY Physicist Wilhelm Konrad Roentgen (1845–1923) discovered x-rays, used in the diagnosis of cancer. Within a few years, this led to the use of radiation for cancer treatment. 1895 USA Walter B. Cannon (1871–1945) was still a college student when he fed bismuth and barium mixtures to geese, outlining their gullets on an x-ray plate (the forerunner of the barium meal examination). 19th century Invention and use of the modern microscope, which later helped identify cancer cells. 19th century GERMANY Rudolph Virchow (1821–1902), “the founder of cellular pathology,” also determined that all cells, including cancer cells, are derived from other cells. He was the first to coin the term “leukemia” and believed that chronic inflammation was the cause of cancer. 19th century GERMANY Surgeon Karl Thiersch showed that cancers metastasize through the spread of malignant cells. 19th century UNITED KINGDOM Surgeon Stephen Paget (1855–1926) first deduced that cancer cells spread to all organs of the body by the bloodstream, but only grow in the organ (“soil”) they find compatible. This laid the groundwork for the true understanding of metastasis. 19th century UNITED KINGDOM Dr. Thomas Beatson discovered that the breasts of rabbits stopped producing milk after he re- moved the ovaries. This control of one organ over another led Beatson to test what would happen if the ovaries were removed in patients suffering from advanced breast cancer, and he found that oophorectomy often resulted in improvement. He thus discovered the stimulating effect of estrogen on breast tumors long before the hormone was discovered. This work provided a foundation for the modern use of hormones and analogs (e.g. tamoxifen, taxol) for treatment and prevention of breast cancer. Before 1900 Lung cancer was extremely rare; now it is one of the most common cancers. Page 2 By 1900 Hundreds of materials, both man-made and natural, were recognized as causes of cancer (carcinogens). 1902 X-ray exposure led to skin cancer on the hand of a lab technician. Within a decade, many more physicians and scientists, unaware of the dangers of radiation, developed a variety of cancers. 1905 UNITED KINGDOM Physicians at the Royal Ophthalmology Hospital reported the first case of “hereditary” retinal glioma, which presented in the child of a parent cured of the disease. 1907 USA Epidemiological study found that meat-eating Germans, Irish, and Scandinavians living in Chicago had higher rates of cancer than did Italians and Chinese, who ate considerably less meat. 1910 AUSTRIA First national cancer society founded: Austrian Cancer Society. 1911 FRANCE Marie Curie was awarded a second Nobel Prize, this time in chemistry, in recognition of her work in radioactivity. 1900 – 1950 Radiotherapy— the use of radiation to kill cancer cells or stop them dividing— was developed as a treatment. 1911 USA Peyton Rous (1879–1970) proved that viruses caused cancer in chickens, for which he was eventually awarded the Nobel Prize in 1966. 1913 USA The American Cancer Society was founded as the American Society for the Control of Cancer (ASCC) by 15 physicians and business leaders in New York City. In 1945, the ASCC was renamed the American Cancer Society. It remains the world’s largest voluntary health organization. 1915 JAPAN Cancer was induced in laboratory animals for the first time by a chemical, coal tar, applied to rabbits’ skin at Tokyo University. Soon many other substances were observed to be carcinogens, including benzene, hydrocarbons, aniline, asbestos, and tobacco. 1926 UNITED KINGDOM Physician and epidemiologist Janet Lane-Claypon (1877–1967) published results from a study that demonstrated some of the major contemporary risk factors for breast cancer among women, including not breastfeeding, being childless, and older age at first pregnancy. 1928 GREECE George Papanicolaou (1883–1962) identified malignant cells among the normal cast-off vaginal cells of women with cancer of the cervix, which led to the Pap smear test. 1930 GERMANY Researchers in Cologne drew the first statistical connection between smoking and cancer. 1930s PUERTO RICO Dr. Cornelius Rhoads, a pathologist, allegedly injected his Puerto Rican subjects with cancer cells—13 people died. 1933 The Union for International Cancer Control (UICC) founded. 1933 SPAIN First World Cancer Congress held in Madrid. 1930s – 1950s Classification of breast cancer introduced, enabling the planning of more rational treatment tailored to the individual. 1934 UNITED KINGDOM Drs. W. Burton Wood and S. R. Gloyne reported the first two cases of lung cancer linked to asbestos. 1937 USA National Cancer Institute inaugurated. 1939 USA Drs. Alton Ochsner and Michael DeBakey first reported the association of smoking and lung cancer. 1939 – 1945 During the Second World War, the US Army discovered that nitrogen mustard was effective in treating cancer of the lymph nodes (lymphoma). This was the birth of chemotherapy— the use of drugs to treat cancer. 1943 – 1945 DENMARK, UNITED KINGDOM First national cancer registries established. 1947 CANADA Dr. Norman Delarue compared 50 patients with lung cancer with 50 patients hospitalized with other diseases. He discovered that over 90% of the first group— but only half of the second— were smokers, and confidently predicted that by 1950 no one would be smoking. 1947 USA Sidney Farber (1903–73), one of the founders of the specialty of pediatric pathology, used a derivative of folic acid, methotrexate, to inhibit acute leukemia in children. 1940s – 1950s USA Dr. Charles B. Huggins’ (1901–97) research on prostate cancer changed the way scientists regard the behavior of all cancer cells, and for the first time brought hope to the prospect of treating advanced cancers. He showed that cancer cells were not autonomous and self-perpetuating but were dependent on chemical signals such as hormones to grow and survive, and that depriving cancer cells of these signals could restore the health of patients with widespread metastases. He was awarded the Nobel Prize in 1966 (shared with Peyton Rous). 1950 USA Gertrude Elion (1918–99) created a purine chemical, which she developed into 6-mercaptopurine, or 6-MP. It was rapidly approved for use in childhood leukemia. She received the Nobel Prize in 1988. 1950 USA The link between smoking and lung cancer was confirmed. A landmark article from The Journal of the American Medical Association appeared on May 27th, 1950: “Tobacco smoking as a possible etiologic factor in bronchogenic carcinoma” by E.L. Wynder and Evarts Graham. The same issue featured a full-page ad for Chesterfields with the actress Gene Tierney and golfer Ben Hogan; the journal accepted tobacco ads until 1953. 1951 UNITED KINGDOM Dr. Richard Doll and Prof. Austin Bradford Hill conducted the first large-scale study of the link between smoking and lung cancer. 1952 USA Epidemiologists at the American Cancer Society launched the Hammond-Horn Study, a long-term follow-up study of 188,000 men designed to examine the association of cigarette smoking with death from cancer and other diseases. 1953 UNITED KINGDOM James Watson and Francis Crick described the double helical structure of DNA, marking the beginning of the modern era of genetics. 1954 USA First tobacco litigation against the cigarette companies, brought by a widow on behalf of her smoker husband, who died from cancer. The cigarette companies won. 1956 USA Dr. Min Chiu Li (1919–1980) first demonstrated clinically that chemotherapy could result in the cure of a widely metastatic malignant disease. 1960 JAPAN Group cancer screening for stomach cancer began with a mobile clinic in Tohoku region. 1960 USA Dr. Min Chiu Li published another important and original finding: the use of multiple-agent combination chemotherapy for the treatment of metastatic cancers of the testis. Twenty years later, it was demonstrated that combination chemotherapy, combined with techniques for local control, had virtually eliminated deaths from testicular malignancy. 1963 JAPAN Cancer research programs were established by the Ministry of Health and Welfare and the Ministry of Education, Science, and Culture. 1964 USA Physician Irving J. Selikoff (1915–92) published the results from a study linking asbestos exposure to the development of mesothelioma. 1964 USA First US Surgeon General’s report on smoking and health. 1965 FRANCE WHO established the International Agency for Research on Cancer (IARC), based in Lyon, France. 1966 International Association of Cancer Registries (IACR) founded. 1960s – 1970s Trials in several countries demonstrated the effectiveness of mammography screening for breast cancer. 1970s USA, ITALY Bernard Fisher in the USA and Umberto Veronesi in Italy both launched long-term studies as to whether lumpectomy followed by radiation therapy was an alternative to radical mastectomy in early breast cancer. These studies concluded that total mastectomy offered no advantage over either lumpectomy or lumpectomy plus radiation therapy. 1971 USA The National Cancer Act in President Nixon’s “War on Cancer” mandated financial support for cancer research, outlined intervention strategies, and, in 1973, established the Surveillance, Epidemiology, and End Results (SEER) program, a network of population-based cancer registries. 1973 USA Bone marrow transplantation first performed successfully on a dog in Seattle by Dr. E. Donnall Thomas (1920–2012). This led to human bone marrow transplantation, resulting in cures for leukemias and lymphomas. In 1990, Dr. Thomas won a Nobel Prize for his work. 1970s Childhood leukemia became one of the first cancers that could be cured by a combination of drugs. 1970s USA Discovery of the first cancer gene (the oncogene, which in certain circumstances can transform a cell into a tumor cell). 1970s ONWARDS WHO, UICC, and others promoted national cancer planning for nations to prioritize and focus their cancer control activities. 1981 JAPAN Professor Takeshi Hirayama (1923–95) published the first report linking passive smoking and lung cancer in the non-smoking wives of men who smoked. 1981 ITALY Dr. G. Bonnadona in Milan performed the first study of adjuvant chemotherapy for breast cancer using cyclophosphamide, methotrexate, and 5-fluorouracil, resulting in reduction of cancer relapse. Adjuvant chemotherapy is now standard treatment for lung, breast, colon, stomach, and ovary cancers. 1980s USA Kaposi’s sarcoma and T-cell lymphoma linked to AIDS. 1982 USA Nobel Laureate Baruch S. Blumberg was instrumental in developing a reliable and safe vaccine against hepatitis B (which causes primary liver cancer). 1980s AUSTRALIA Barry Marshall and J. Robin Warren identified bacterium H. pylori, noting it caused duodenal and gastric ulcers and increased the risk of gastric cancer. 1980s USA Vincent DeVita developed a four-drug combination to significantly raise the cure rate of Hodgkin disease to 80%. Mid-1980s Human Genome Project was initiated to pinpoint location and function of estimated 50,000– 100,000 genes that make up the inherited set of “instructions” for functions and behavior of human beings. 1980s WHO Program on Cancer Control established. 1988 First WHO World No Tobacco Day, subsequently an annual event. 1989 European Network of Cancer Registries (ENCR) established. 1989 USA National Institutes of Health researchers performed the first approved gene therapy, inserting foreign genes to track tumor-killing cells in cancer patients. This project proved the safety of gene therapy. 1991 Evidence linking specific environmental carcinogens to telltale DNA damage emerged, e.g. sub radiation was found to produce change in tumor suppressor genes in skin cells, aflatoxin (a fungus poison) or hepatitis B virus to cause a mutation in the liver, and chemicals in cigarette smoke to switch on a gene that makes lung cells vulnerable to the chemicals’ cancer-causing properties. 1994 USA, CANADA, UNITED KINGDOM, FRANCE, JAPAN Scientists collaborated and discovered BRCA1, the first known breast and ovarian cancer predisposing gene. 1994 USA National Program of Cancer Registries (NPCR) established. 1995 Gene therapy, immune system modulation, and genetically engineered antibodies used to treat cancer. 1999 NETHERLANDS, USA Jan Walboomers of the Free University of Amsterdam and Michele Manos of Johns Hopkins University provided evidence that the human papillomavirus (HPV) is present in 99.7% of all cases of cervical cancer. 1999 The Bill & Melinda Gates Foundation awarded a five-year, $50 million grant to the Alliance for Cervical Cancer Prevention (ACCP), a group of five international organizations with a shared goal of working to prevent cervical cancer in developing countries. Page 3 2000 53rd World Health Assembly presided over by Dr. Libertina Amathila (Namibia) endorsed “Global strategy for non-communicable disease (NCD) prevention and control,” which outlined major objectives for monitoring, preventing, and managing NCDs, with special emphasis on major NCDs with common risk factors and determi- nants— cardiovascular disease, cancer, diabetes, and chronic respiratory disease. 2000 The entire human genome is mapped. 2000 Charter of Paris against Cancer is signed. 2001 LUXEMBOURG International Childhood Cancer Day was launched, its aim to raise awareness of the 250,000 children worldwide who get cancer every year. Some 80% of these children have little or no access to treatment. The first annual event in 2002 was supported in 30 countries around the world and raised over US$100,000 for parent organizations to help children in their own countries. 2004 SWITZERLAND WHO cancer prevention and control resolution approved by World Health Assembly. 2005 WHO Framework Convention on Tobacco Control came into force, using international law to further public health and prevent cancer. 2006 USA The US Federal Drug Administration approved the first HPV vaccine to prevent infections that cause cervical cancer. 2011 Lung cancer deaths reduced by low-dose computed tomography (CT) scanning of people at high risk. 2011 UN High Level Meeting on Non-communicable Diseases in New York, USA. 2013 The US FDA approved sofosbuvir for use in combination with other agents for the treatment of chronic HCV infection in adults, reducing treatment time and toxicity compared with earlier treatments and increasing cure rates to more than 80%. 2015 A goal to reduce premature mortality from NCDs including cancer by one-third by 2030 was added to the United Nations Development Programme’s Sustainable Development Goals. 2015 Achievement of universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all, was added to the United Nations Sustainable Development Goals. 2017 The US FDA approved the first adoptive cell immunotherapy, also known as chimeric antigen receptor (CAR) T-cell therapy. 2017 The World Health Assembly of the World Health Organization renewed its commitment to cancer prevention and control through the adoption of a resolution providing countries with guidance for health promotion and risk factor reduction, with particular emphasis on the tobacco control policies laid out in the Framework Convention on Tobacco Control and anti-cancer vaccines, but also the need to address inequity in access to early detection and timely and appropriate treatment, including pain relief and palliative care. 2018 World Health Organization Director General Dr. Tedros Adhanom Ghebreyesus calls for coordinated global action for the elimination of cervical cancer. 2018 The World Health Organization announces the Global Initiative for Childhood Cancer with the aim of reaching at least a 60% survival rate for children with cancer by 2030, representing a doubling of the global cure rate for children with cancer.