THE CAUSES OF CANCER The interplay between nature and nurture

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Both inheritance and environment are important determi nants of cancer development. Neither influence is completely dominant. The balance between genes and the environment is context specific and not consistent. Two contrasting examples are br east and lung cancer. Although not all smokers develop lung cancer and lung cancer can occur in people who have Otto Warburg , 1883–1970, chemist, Director of the Kaiser Wilhelm Institute for Cell Physiology , Berlin-Dahlem, Germany . Awarded the Nobel Prize in Physiol ogy or Medicine in 1931 for ‘his discovery of the nature and mode of action of the respiratory enzyme’. Benjamin Gompertz , 1779–1865, an insurance actuary who described mathematically the relationship between life expectancy and age. The Gompertzian function provides an excellent fit to data points plotting tumour siz e against time. - never smoked, non-small cell lung cancer is much more common in smokers and is such a powerful risk factor that it accounts for approximately 80% of the disease. Conversely , germline BRCA gene mutations are highly penetrant and 13 , it women with a BRCA1 mutation can have a 60–90% lifetime risk of being diagnosed with breast cancer and 40–60% will develop ovarian cancer. Knowledge about the causes of cancer can be used to design appropriate strategies for prevention or earlier diagnosis. As we find out more about the genes associated with cancer, genetic testing and counselling play increasingly important roles in the prevention of cancer. These considerations are incorporated into Table 12.1 , on the inherited cancer syndromes, and into Table 12.2 , on the environmental contribution to cancer.

12 10 10 10 Limit of clinical detection 8 10 Cells 6 10 4 10 2 10 1 0 100 200 300 400 500 600 Time Figure 12.2 The Gompertzian curve describing the growth of a typical tumour. In its early stages, growth is exponential but, as the tumour grows, the growth rate slows. This decrease in growth rate probably arises because of dif /f_i culties with nutrition and oxygenation. The tumour cells are in competition: not only with the tissues of the host, but also with each other.

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