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In the 1950s, sleeping pills were in high demand, however there were growing concerns around the safety of those in use. In 1957, a new drug, thalidomide, was developed by German pharmaceutical company Grünenthal, and became a popular sedative. It was also discovered that it could be used to treat morning sickness in pregnant women. However, after it was put into use, it caused an estimated 10,000 children to be born with significant birth defects (such as missing limbs), mostly in Europe, Canada, Australia, and parts of Asia, so was discontinued.

Around half to two thirds of pregnant women experience what is known as morning sickness. This can involve nausea and vomiting, loss of appetite, depression, and anxiety. The exact cause is unknown, however it may be due to fluctuating blood pressure (especially low blood pressure), high and varying levels of hormones, and/or altered metabolism of carbohydrates.

Thalidomide was originally released as an antihistamine for influenza, with more than a dozen other potential uses. At the time, all (or most) sleeping pills were based on barbiturates, which were easy to overdose on, and for which there was growing evidence of behavioural problems and addiction. When thalidomide was found to be an effective sleeping pill, it quickly became popular as an apparently safer alternative to barbiturates. It was most damaging, however, when it was targeted specifically toward pregnant women, as a treatment for morning sickness.

When thalidomide was released, it had not been tested very thoroughly, likely due to a lack of strict regulations. This was partly due to the widespread belief that drugs could not cross the placenta and damage the foetus, so many patients were not tracked beyond the point at which they stopped using the drug. Because of these incomplete tests and their consequences, governments subsequently greatly tightened the approval processes and ongoing regulations for drugs.

Thalidomide molecules consist of two sections, as shown in images 1-3. The double ringed section is believed to be responsible for the damage to the foetus, while other section is likely responsible for the sedative effects. There are two similar conformation of the molecule, which differ only by the direction of the join between the two sections. In image 1, one form would have the double-ringed structure raised from the page, while the other would have it lowered into the page. Though the difference between the two forms is small, one form, R+, is safe—while the other, S-, is dangerous. These two forms can interconvert while in the blood and liver, so just administering the safe form is not successful.

The exact mechanism through which thalidomide causes birth defects is unknown, however multiple hypotheses are have been proposed. One is that thalidomide can increase the number of reactive oxygen species (where 'species' means 'groups of chemicals'), some examples of which are oxygen ions, free radicals, and peroxides. These are part of the immune system's killing response during bacterial invasions, and can cause apoptosis (controlled cell death) and other cell damage when high quantities are present.

Other studies have shown that thalidomide inhibits the formation of new blood vessels. It does this by inactivating a protein called fibroblast growth factor type 2 (FGF-2), which would normally cause a cascade of other reactions, eventually forming a blood vessel. The arms and legs may be particularly vulnerable, due to blood vessels being important for forming other parts of the limbs.

More recently, thalidomide has been reintroduced and trialled in order to treat various conditions, including skin lesions caused by leprosy, mouth ulcers caused by HIV/AIDS, Bechet's syndrome, Crohn's disease, and other inflammatory diseases. It may also be used to treat certain types of cancer. Many tumours require new blood vessels to form in order to grow—as thalidomide can reduce this, it may be able to limit tumours to the size of a pinhead. Thalidomide has also been found to inhibit tumour necrosis factor alpha (TNFα), a protein involved in inflammation and the progression of cancer.

Overall, thalidomide caused widespread damage due to inadequate testing, and incorrect knowledge about what needed to be tested (the effects on the foetus). However, it has now been found to be an effective anti-inflammatory drug, and is effective at treating multiple diseases (so long as it is administered safely). Additionally, the effects that are so damaging to rapid growth in foetuses have been found to also prevent rapid growth of tumours, making it a potentially effective cancer treatment.

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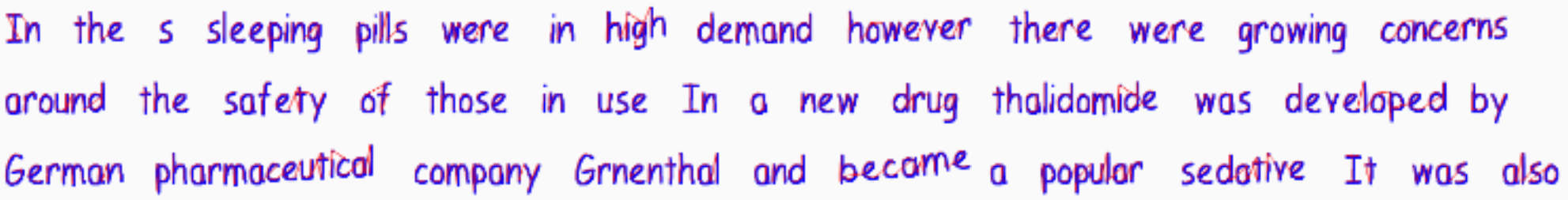

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