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By Dahm, Ralf

Few remember the man who discovered the molecule of life three- quarters of a century before Watson and Crick revealed its structure On February 26, 1869, in the old university town of Tubingen in southwest Germany, the young Swiss doctor Friedrich Miescher, who had settled there only a few months earlier, completed a letter to his uncle in which he described a momentous discovery. He had found a substance that he was certain resided in the cell nucleus and which differed in chemical composition from proteins or any other compound known at the time. Without grasping the reach of his work, Miescher had started one of the greatest scientific revolutions. Years later, it would completely change the fundamental understanding of life and lead to medical breakthroughs unimaginable in Miescher's time.

Johann Friedrich Miescher was born into a family of scientists in 1844 (he was always known as Friedrich, even in his publications later in life). Miescher's father and his maternal uncle, Wilhelm His, were distinguished medical doctors and professors of anatomy and physiology at the University of Basel in Switzerland. A range of scientists frequently visited the home, and their lively discussions exposed the young Miescher to a variety of scientific ideas and concepts. In such surroundings, Miescher developed a keen interest in the natural sciences. At the age of 17 he started his studies of medicine in Basel and graduated in 1867 when he was only 23 years old.

At first he considered practicing medicine, like his father. However, poor hearing from an illness he had contracted in childhood would have made some parts of that job difficult for him. His fascination with the sciences suggested research as an avenue for him to pursue. Inspired by his uncle's conviction that the last remaining questions concerning the development of tissues could only be solved on the basis of chemistry, Miescher decided to study biochemistry.

In the spring of 1868 he moved to Tubingen to work under the guidance of two of the most renowned scientists of the time: the organic chemist Adolf Strecker, in whose laboratory Miescher worked for one semester, and the biochemist Felix Hoppe-Seyler, one of the pioneers in a nascent branch of science referred to as physiological chemistry. Between 1860 and 1871, Hoppe-Seyler headed one of the first biochemical laboratories worldwide. It was located in Tubingen's medieval castle, high above the old town and the surrounding river valleys (Hoppe-Seyler's laboratory was in a converted laundry room, whereas Miescher's was put in the former kitchen). Hoppe-Seyler had previously accomplished, among other things, groundbreaking experiments concerning the properties of hemoglobin-seminal work that was to influence countless subsequent studies on the structure and function of this and other proteins. In a very short span of time, his laboratory had attained a reputation that reached far beyond the boundaries of the city.

Elementary Analyses

Under Hoppe-Seyler's guidance, Miescher set out to determine the chemical composition of cells. Lymphocytes were to serve as the source material for these studies. By studying this most simple and independent cell type, he hoped to understand the secrets of cellular life. But lymphocytes proved difficult to purify from lymph glands in the large quantities needed for chemical analyses. Hoppe- Seyler, who had a long-standing interest in the nature of blood, likely suggested that Miescher turn to closely related leukocytes instead. Thus the discovery of DNA made a rather unappetizing start: Miescher isolated the cells he needed from the pus on wound dressings he obtained from the surgical hospital in Tubingen. At the time, a plentiful production of pus from wounds was still widely held to be a requirement to purge the body of harmful substances. Antiseptics were not yet commonly used and purulent bandages were available in large quantities.

First of all, Miescher had to develop methods to wash the leukocytes from the surgical cloth. He tested a variety of salt solutions, always checking the outcome of his trials under a microscope. Once he had established the conditions, he set out to characterize and categorize the different proteins and lipids he isolated from the cells. Like many of his contemporaries, he hoped to discover how cells work by analyzing their proteins, so Miescher described their properties and attempted to classify them. But his work was plagued with setbacks. The diversity of proteins within a cell was too much for the relatively primitive methods and equipment of his time. During his experiments, however, Miescher detected a substance with unexpected properties. It could be precipitated by acidifying the solution and redissolved by making the solution more alkaline. Unknowingly, Miescher had, for the first time, obtained a crude precipitate of DNA.

But where did this enigmatic substance come from? When Miescher had extracted leukocytes with acids, he had noticed that prolonged exposure of the cells to diluted hydrochloric acid resulted in a cellular residue consisting of what looked like isolated nuclei. He also noticed that these nuclei could no longer be stained yellow with iodine, an indication that the proteins had been largely extracted. Very weak alkaline solutions led to a strong swelling of the nuclei, without, however, dissolving them. Based on these observations Miescher speculated that his mysterious precipitate could only belong to the nuclei.

At that time, very little was known about this organelle. Although the nucleus had been discovered as early as 1802, its function in the cell remained a matter of intense controversy and speculation. However, in 1866, three years prior to Miescher's discovery, the influential German biologist Ernst Haeckel had proposed that, the nucleus contained the factors responsible for the transmission of hereditary traits. This suggestion led to a renewed interest in the role of the nucleus. Miescher's serendipitous finding opened a door to gleaning more information on the nature of this mysterious organelle.

Before being able to further characterize the nuclear precipitate, however, Miescher had to develop protocols to isolate nuclei with higher purity. After many trials, he finally hit on a method. He rinsed the cells several times with fresh solutions of a diluted hydrochloric acid over a period of several weeks at wintry temperatures, which were important to minimize degradation of his material. This treatment broke apart the cells' membranes and stripped most of the cytoplasm off the nuclei. He next removed the lipids by vigorously shaking the material in a combination of water and ether. When the mixture settled, Miescher observed mat the extracted nuclei sank to the bottom of the vessel as fine granules. When he added alkaline solutions to these nuclei, he found that they swelled and faded, just as he had seen with his earlier preparations. When he added acid, on the other hand, the swelling was reversed and again a white, woolly precipitate appeared. With these experiments Miescher showed that the precipitate he had previously observed had indeed come from the nuclei. As a consequence, Miescher later named it nuclein, a term still preserved in today's name deoxyribonucleic acid.

Despite nuclein's unusual behavior, Miescher was not yet entirely convinced that it was distinct from protein. He thus devised further experiments to learn more about the nature of this strange molecule. Chiefly, he intended to determine its elementary composition, but to do so he needed still purer nuclein. In particular, he had to remove as much of the contaminating cytoplasm as possible. Miescher decided to try a method that Wilhelm Kuhne had described only one year earlier in his textbook on physiological chemistry. Kuhne had observed that cells can be broken apart with solutions containing the digestive enzyme pepsin, which dissolves cytoplasm without attacking nuclei.

This approach was precisely what Miescher needed. Unfortunately, at the time, pepsin could not be ordered from a chemical supplier. Instead Miescher had to isolate it for himself. Thus he embarked on the second unsavory part of his scientific journey: He rinsed out pig stomachs with diluted hydrochloric acid and filtered the washed- out contents to obtain a crude solution of protein-digesting enzymes. Treating cells with this solution not only chewed apart the proteins, it also showed that nuclein was indeed not a protein.

Now Miescher finally had an optimized protocol to isolate DNA. He began by washing the leukocytes several times with warm alcohol. This broke the cells up and removed most of the cytoplasm. Moreover, it dissolved most lipids. Subsequently, he digested the extract with his pepsin solution. This treatment resulted in a fine, gray sediment. To remove residual lipids, Miescher shook the sediment in ether and again in warm alcohol. He noted that the nuclear mass purified in this way showed the same chemical behavior as the nuclear extracts isolated with his previous protocols. Next, Miescher washed the preparation with alkaline solutions, such as highly diluted sodium carbonate. When subsequently adding an excess of acetic or hydrochloric acid, he got a flocculent precipitate, which he could redissolve by adding alkaline solutions. This precipitate was the first comparatively dean preparation of DNA, pure enough for Miescher to finally embark on an analysis he had been planning for some time: to determine which elements make up nuclein. Elementary analyses were one of the few methods available to characterize novel molecules at the time. The procedures involved heating the substance in the presence of various chemicals that selectively reacted with the different constituent elements. The resulting reaction products were weighed to determine the amount of each element present in the substance under test. The process was laborious and time consuming, so much so that Miescher called it factory work, but he kept at it. So far, Miescher had established that nuclein behaved differently from proteins and lipids in his isolation procedure: Enzymes capable of breaking down proteins were unable to degrade it, and it could not be extracted by strong organic solvents. The analysis of its elementary composition held another surprise for Miescher. Besides containing the elements carbon, oxygen, hydrogen and nitrogen, which are known to be very abundant in proteins, the molecule did not contain sulfur and it did harbor large quantities of phosphorus. The latter was a very unusual finding because virtually no other organic molecules containing phosphorous were known at the time. This result finally convinced Miescher that he had discovered a fundamentally new type of cellular substance.

Members of Hefei Nonggong Dang LIU Shang-all proposals: to investigate the nutritional status of iodine in Hefei

Iodine is an essential body of a trace elements, inadequate intake, the plane experiences a series of obstacles. Such as: endemic goiter, cretinism , iodine deficiency can also lead to infertility, premature birth, stillbirth, congenital malformations, and so on. One of the hazards of iodine deficiency is the most important influence fetal brain development, leading to children s intellectual and physical development obstacles, iodine deficiency caused by damage to the population of smart, endemic areas to reduce the quality of the population, in 1990 the United Nations Declaration adopted at the summit for the year 2000 In the global elimination of iodine deficiency disorders. Universal salt iodization as the prevention of iodine deficiency disorders and effective measures in the 1980s in Switzerland, the United States, Austria and other countries to promote government action to start, India in the late 1980s, American States in 1994, started the implementation of universal salt iodization Policies; China at the end of 1995 started the implementation of universal salt iodization. China s 2006 annual report showed that iodized salt monitoring of the overall consumption of iodized salt has reached 96.9 percent.

Universal salt iodization, it does lead to the effective control of iodine deficiency disorders, improving the quality of the population has played a role of inestimable, but with the increase in iodine intake, the incidence of thyroid disease have shown an increasing trend, the incidence of hyperthyroidism Increase the rate of most concern. The United States in the 1920s iodine after the 1924

Switzerland in 1923, the incidence rate of hyperthyroidism Increased to 5 / 300,000 in 1980, again raised the level of iodine, and then another two years, the incidence rate increased by 10%. The former Soviet Union, the Netherlands, Australia, Yugoslavia, Austria, Hungary, and so have similar coverage in the 1960s after a number of developing countries, such as: Zimbabwe, Brazil, Chile, also found the same phenomenon. 1995 World Health Organization (WHO) and the International Committee of the control of iodine deficiency diseases in Zimbabwe before and after the implementation of universal salt iodization retrospective survey, hyperthyroidism incidence rate of 2.8/10 from before the introduction of up to 000 years after the implementation of the 7.4/10 000 years in 1998, Austria has a 19 regions participated in the samples for more than 40 million people of the multi-center study found that: When the concentration of iodized salt from 10 mg / kg to 20 mg / kg, clinical hyperthyroidism And sub-clinical hyperthyroidism (to reduce the concentration of serum TSH, FT4, FT3 normal concentration) incidence rate of increase of 36% and 64%.

Application of iodized salt in China after a number of phenomena hyperthyroid patients, more than 20,000 people in Shanghai a retrospective survey found that the implementation of universal salt iodization, median urinary iodine from the annual 64.5 ug / L rose to 231 ug / L , Hyperthyroidism the incidence of 14.8/10 from a year rose from 000 million a year 31.4/10. Wu Yi, Czech Republic, and other school-age children in the Shanghai area as a urinary iodine levels of iodine intake to change the objective indicators, a company in the observation of universal salt iodization in the period before and after a total of five changes in the incidence of hyperthyroidism was found two years ago iodization incidence rate of hyperthyroidism 8.2/10 million people a year, after three years of iodized increased to 31.4/10 million people in Tianjin to the information of 20 changes in the incidence of thyroid diseases, showed that the incidence of the city Hyperthyroidism level in 1982 after a declining trend, continued A section of low-level (1982

Wuchuan in Zhanjiang City and Xuwen County Pozhen Huang Chi-mai Mr Chan conducted a survey study, the results show that mild iodine deficiency in the region after the implementation of universal salt iodization, is a side effect of hyperthyroidism caused by iodine. According to the survey, residents of the town of iodine before the two incidence rate of hyperthyroidism There was no significant difference, but the implementation of the iodization of salt, so that the original mild iodine deficiency in iodine intake of the residents of the rapid increase, a rapidly increasing incidence of hyperthyroidism , In the first and second years before the iodization of salt was increased to two times, three to four years in the same high degree of wandering, and before the iodization of salt is very significant difference.

These data show that: iodine intake increased, resulting in excessive iodine lead to hyperthyroidism is an indisputable fact.

Since the January 1996 implementation of the policy of universal salt iodization, Hefei crowd coverage of iodized salt as of 2006 has exceeded 96 percent, basically reached the national standard, but the status of iodine nutrition in Hefei Whether the level of iodine nutrition standards Or already in excessive iodine status Hyperthyroidism incidence of elevated levels over the previous These problems need to be addressed through research! City research the actual level of iodine nutrition and iodized hyperthyroidism after the actual incidence rate of the existing situation in the country within the framework of the concentration of iodine salt, formulated for the region s concentration of salt iodization is a very important value. (Information provided Rapporteur Bianhua jade)

About the Author

From www.redorbit.com:

Information on iodine and the vegan diet. Low zinc intakes exacerbate the effect of low iodine intake. Some otherwise healthful foods contain.
Optimal iodine nutrition is necessary to fully realize the human intellectual capabilities in a community. Iodine deficiency is the single.
A survey of the databanks Medline and Web of science identified studies dealing with maternal and infant iodine nutrition during.
Try to ensure optimal iodine nutrition for these susceptible groups. As the first step, countries need to assess and categorize.
Learn more about iodine, its essential function in the human body, and the symptoms of an iodine.

Recent Advances in Iodine Nutrition. Michael Donaldson, PhD. Summary. Though iodine is known for its importance for the thyroid, little has been publicized.

For thyroid nutrition, thyroid hormone formation, body temperature. Iosol Iodine is the exact form of iodine needed to make thyroid.

In this review of iodine nutrition in North America, we will focus on the. In the population subset of women of childbearing age, iodine.

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