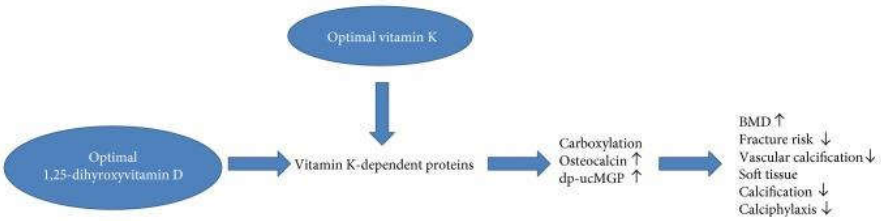


Figure 1**.** Simplified overview of potential synergy between vitamins D and K and bone and cardiovascular health. dp-ucMGP: dephosphorylated-uncarboxylated matrix Gla protein: Osteopenia is a loss of bone mineral density (BMD): bone mineral density

Genetic, molecular, cellular, and human evidence support those optimal concentrations of both vit. D and vit. K are beneficial for bone and cardiovascular health. Vit. K is needed for the carboxylation of vit. K-dependent proteins such as osteocalcin and matrix Gla protein, while vit. D promotes the production of vit. K-dependent protein concentrations. These vit. K-dependent proteins are needed for extrahepatic organs such as the bone and the vascular system. This will result in bone mineralization and will inhibit soft tissue calcification, which will ultimately lead to lower risks of fractures and coronary heart disease.

**Conclusions.** Taken together, animal and human studies suggest that optimal concentrations of both vit. D and vit. K are beneficial for bone and cardiovascular health as supported by genetic, molecular, cellular, and some human studies. However, vit. D and calcium supplementation along with vit. K deficiency might also induce long-term soft tissue calcification and CVD, particularly in vit. K antagonist users and other high-risk populations. At this moment, we should be careful about supplementing high-dose vit. D, unless indicated differently. More clinical data about the potential interplay between vit. D and vit. K metabolism is urgently needed before broader treatment recommendations can be given. The consumption of a well-balanced diet is key for population-based primary prevention of chronic diseases. As more is discovered about the powerful combination of vitamins D and K, it gives a renewed reason to eat a healthy diet including a variety of foods such as vegetables and fermented dairy for bone and cardiovascular health.

## HEREDITARY HUMAN DISEASES

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**Introduction.** Did you know that we can pass on genetic disorders to our children, even if we do not suffer from them ourselves? In fact, we only need to be carriers to pass them down our offspring. In other words, even if we have not developed symptoms, if we are carriers, our children are at risk of inheriting the disorder. We can also develop hereditary diseases if an error occurs during foetal formation; these are the cases where the parents are not carriers.

**Aim.** The purpose of the study is to analyse scientific research on hereditary disorders and how they can be passed down from generation to generation.

**Materials and methods.** Analytical review of scientific literature on hereditary diseases

**Research results.** A genetic disorder occurs when one or more genes are altered. If this genetic alteration is passed on to offspring, then it is a hereditary genetic disorder. Therefore, we should clarify

that not all genetic disorders are hereditary, since they are often not passed on to children. For a genetic disorder to be inherited, the altered gene must be found in the germline cells of the affected individual. In other words, in the eggs or in the sperm cell; that is why the genetic combination of the biological parents is influential when it comes to passing on diseases to our children.

Hereditary disorders do not necessarily present symptoms from birth. However, congenital ones do. With the information we have provided so far, we can make these distinctions. Genetic disorders: these are the result of the alteration of one or more genes and may or may not be hereditary. Hereditary disorders: these all have a genetic origin, i.e. they are the result of the alteration of one or more genes and are passed on through generations. Symptoms may not necessarily present themselves from birth. Congenital disorders: these can be hereditary or not, and in these disorders, individuals present symptoms from birth. Genetics and environment. All the examples of hereditary diseases we have seen so far are the result of a gene alteration, i.e. they have a genetic origin. However, there are many diseases that have both genetic and environmental risk factors. The genetic load carries a lot of importance in these cases, but certain circumstances are also needed to trigger the disease.

**Conclusions.** As we have seen, genetics and the development of disorders are intrinsically linked, which is not surprising, since our genes contain the instructions that tell our bodies how to function properly, and if these are altered it is likely that disorders will appear.

## IMMUNOTHERAPY AND CANCER VACCINES: PRINCIPLE OF ACTION AND MECHANISM OF MODERN DEVELOPMENTS

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**Introduction.** Immune system`s responses are not always able to prevent the development of tumors because the tumors have escape mechanisms that can evade the immune system. In addition, the tumor cells are derived from the host cells and therefore they are very similar to these cells and tend to be weakly immunogenic. The basic relationship between cancer and immunity involves three principles of how the immune system acts to protect and defend the individual: it detects "foreign" antigens from pathogens or infected/malignant cells, antigens from pathogenic or infected/malignant cells; it engages in effector functions to target the destruction of pathogenic or infected/malignant cells while protecting the body; and it develops immunological memory through adaptive immune responses to further protect mechanisms after injury or attack on the host.

**Aim.** In order to protect and maintain normal homeostasis, the immune system consists of two forms of immune response: innate and adaptive (Fig. 1) Nonspecific and immediate immune responses are classified as innate because of their rapid nonspecific response to foreign antigens (pathogenic microbes, allergenic antigens, or molecules (Fig. 1). It is still able to form foreign immunological memory, to recognize "self" and "non-self" or different groups of pathogens using receptors.