

# Fascinating Research on Vitamin A From 1925

Analysis by [Sally Fallon Morell](#)

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## STORY AT-A-GLANCE

- › A 1925 study by Wolbach and Howe found that vitamin A deprivation in rats leads to keratinization of epithelial tissues, affecting various body parts including the respiratory and genitourinary tracts, eyes, and glands
- › Vitamin A deficiency resulted in serious health issues such as gland atrophy, growth arrest, emaciation, and ultimately death
- › The study suggested that some cases of cancer could be linked to the accumulation of keratinized cells in organs due to vitamin A deficiency, challenging the notion that infection and inflammation are primary causes of disease
- › Infections and inflammations observed in the study were consequences of gland and organ degeneration due to vitamin A deficiency, not the cause of the initial epithelial changes
- › The negative effects of vitamin A deprivation were successfully reversed by adding butter to the diet, highlighting the importance of including vitamin A-rich foods such as butter from grass fed cows for maintaining optimal health

My colleague Pam Schoenfeld, MS, recently put me onto an eye-opening article on vitamin A. Titled “Tissue Changes Following Deprivation of Fat-Soluble A Vitamin”<sup>1</sup> by S. Burt Wolbach, MD and Percy R. Howe, MD, the article was published in the Journal of Experimental Medicine in 1925. This paper is interesting for several reasons.

## Primary Effects of Vitamin A Deprivation

The first concerns the changes these researchers observed when they deprived rats of vitamin A. The main effect was keratinization of the epithelial tissues.

The epithelial tissues are thin tissues that cover all the exposed surfaces of the body, such as the skin, the inner lining of the mouth, the digestive tract, secretory glands, the lining of hollow parts of every organ such as the heart, lungs, eyes, ears, the urogenital tract, as well as the ventricular system of the brain and central canals of the spinal cord.

Keratinization is the process by which the cells of the epithelium are filled with a hard protein called keratin – think hair and fingernails in humans, beaks, horns, scales and hooves in animals. When our skin sloughs off cells, they first become keratinized and form a thin protective surface on our skin. But mostly the epithelial tissue is soft and mucous-secreting, often composed of hair-like structures called cilia.

Wolbach and Howe found that vitamin A deficiency resulted in the substitution of “stratified keratinizing epithelium for normal epithelium in various parts of the respiratory tract, alimentary tract, eyes, and paraocular [surrounding the eyeball] glands and the genitourinary tract.”

This led to the atrophy of many glands, arrest of growth, emaciation and eventually death. While the rats showed no signs of rickets (the test diet contained vitamin D), the bones and teeth stopped growing.

Notably, “Young rats respond to the deficiency more promptly than adults,” meaning that vitamin A deficiency is more serious in growing children than in their parents.

They found that “deficiency results in loss of specific (chemical) functions of the epitheliums concerned.” In other words, these tissues no longer worked as they should. Interestingly, these changes did not occur in the liver, parenchyma of the kidney, stomach or intestines.

*“In general the respiratory mucosa in nares [nostrils], trachea, and bronchi keratinized first, then the salivary glands, eye, genitourinary tract, then paraocular glands and pancreas.”*

## **Secondary Effects of Vitamin A Deficiency**

The general view at the time was that the eyes were the first organs affected by vitamin A deficiency; the researchers found otherwise.

Following keratinization, many of the glands atrophied, followed by emaciation and localized edema of testes, submaxillary (salivary) gland, and connective tissue structures of the lungs and focal myocardial lesions. The same applies to glandular atrophy. According to the authors, "Glandular atrophy probably explains the loss of power of smell as a late but consistent symptom."

Enamel formation in the teeth was inhibited. "The enamel-forming cells in advanced stages are either shrunken and atrophic or replaced by a narrow layer of stratified, non-keratinizing epithelium." Indeed, many of the changes superficially resembled scurvy.

Other effects included the disappearance of fat in adipose tissue throughout the body, reduction in size of the liver and spleen, and atrophy (wasting away) of a long list of glands: pancreas, thyroid, pituitary and thymus.

Large cysts composed of "desquamated keratinized epithelial cells" formed in the salivary glands, which interfered with swallowing and was often a cause of death; cysts also formed in the lungs "and were so numerous as to be the cause of death."

"Desquamated keratinized epithelial cells" often blocked the bladder and urethra. Cysts were common in the prostate gland and seminal vesicles.

These findings beg the question of whether many cases of "cancer" – in the prostate, bladder, lungs, throat, glands, etc. – are due to the accumulation of sloughed-off keratinized cells in these organs due to vitamin A deficiency.

## **Infections Follow Gland and Organ Degeneration**

Wolbach and Howe described their observations with great care and detail. They noted that "infection" occurred in certain glands and organs but only AFTER the degeneration that followed withholding of vitamin A.

*“Infection and suppuration are very common, but not invariable and have nothing to do in initiating the epithelial change ... Our own experiences in the care of the rats are in complete opposition to the importance of infection, either as an initiating factor in the pathology or as a cause of death.”*

They also noted “edema” or what we call “inflammation” occurred in certain organs, again only AFTER the changes induced by vitamin A deficiency.

*“The occurrence of transient edema in testes and salivary gland coinciding with a period of maximum atrophic change, suggests the hypothesis that this edema is the result of failure of epithelium to utilize transported material ...”*

Today we blame disease on “infection” and “inflammation” but the researchers were careful to point out that these conditions arose as a result of vitamin deficiency, and were NOT the cause of disease. By the way, “edema” most frequently occurred in the salivary glands and the testes – this sounds a lot like mumps to me!

## **Butter Is a Good Source of Vitamin A**

A final detail that I found of interest: the test diet contained lard to supply vitamin D but no vitamin A. Yet food tables today indicate that lard contains a trace amount of vitamin A but no vitamin D! The fact that lard can be a good source of vitamin D is one of those secrets the diet dictocrats don't want you to know about.

The researchers were able to reverse the effects of vitamin A deprivation by adding butter to the diet, and vitamin A in the control diet was also supplied by butter.

The message for modern humans: Include plentiful lard (from pigs raised outdoors) and butter from grass fed cows in your diet in order to keep the lungs, the nasal passages, the bones and teeth, the uro-genital organs and many of the body's important glands in good working order!

## **Brief Commentary by Dr. Mercola**

The devil is in the details, as they say, so I'd like to add a word of caution with regard to lard. Most lard will be high in the omega-6 polyunsaturated fat (PUFA) linoleic acid (LA), which is one of the most destructive ingredients in your diet that contributes to chronic disease states of all kinds.

For this reason, I only recommend lard from hog farmers that are feeding their swine a low-PUFA, low-LA diet and can confirm it by lab testing. For more details on the hazards of LA, see my [special report on linoleic acid](#).

## About the Author

Sally Fallon Morell is author of the best-selling cookbook "Nourishing Traditions" and many other books on diet and health. She is the founding president of the Weston A. Price Foundation ([westonaprice.org](http://westonaprice.org)) and a founder of A Campaign for Real Milk ([realmilk.com](http://realmilk.com)). Visit her blog at [nourishingtraditions.com](http://nourishingtraditions.com).

## Sources and References

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- <sup>1</sup> [Journal of Experimental Medicine September 4, 1925 \(PDF\)](#)