

LOW COST COW/CALF PROGRAM

The Bulletin For Alumni Of The School

Volume 6

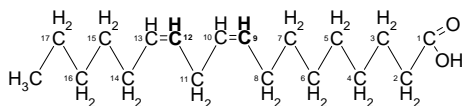
Number 5

More on Fatty Acids

If you did not receive the last two Newsletters (Vol. 6, No 3 & 4), please let us know and they will be mailed. They also are available in the Newsletter/Archive section of the Website. We concluded the last letter with descriptions of two essential fatty acids - Linoleic, **18:2 (ω-6)** and Linolenic, **18:3 (ω-3)**. They are termed essential because our bodies cannot make them—they must be contained in the food we eat. They also serve as starting materials in the formation of other fatty acids. As we read and listen to speeches about the “good for you” fat, we are confronted with **CLA**. It stands for **conjugated linoleic acid** (actually acids). If double bonds and single bonds alternate successively in a molecule, the double bonds are said to be **conjugated**. With the stick figures we have been using, there is a single bond followed by a double bond then a single bond and another double bond and so on. Obviously, the double bonds in CLAs are found in locations different from ω6. *Omega, location of double bonds, conjugated*—any additional nomenclature of which we need to be aware?

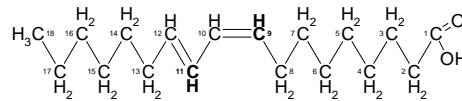
Yup

How about the term isomerism? If you attended The Stockman GrassFarmer's Grassfed Meats & Milk Conference last Nov. in Atlanta, you heard the term isomer bantered about. Isomer means equal or like parts. When referring to CLA, a more descriptive term is **geometrical isomers**. The atoms are arranged in either *cis* or *trans* configuration. Why is it necessary to appreciate CLA configurations? When we commence talking about the “good for you” and “bad for you” fats, isomerism enters the picture. Let's define the chemist's lingo. We must revert back to his carbon numbering. The carboxyl C atom becomes the No 1 C and the ωC No 18 (a departure from the ω terminology).

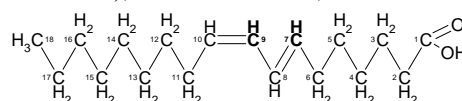


The sketch above is Linoleic acid as we have seen before (non-conjugated). In this

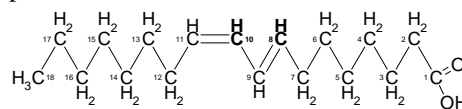
form, it is termed *cis*-9, *cis*-12-Linoleic acid. T.R. Dhiman¹ gives the proportions of *cis/trans* isomers contained in milk, cheese and beef. The *cis*-9, *trans*-11 isomer accounts for more than 90% of the total CLA in milk fat.



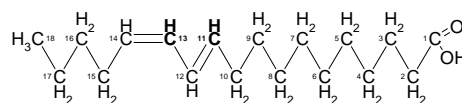
As a percentage of total CLA in cheese fat, there is 78 to 84% *cis*-9, *trans*-11 (the figure above), 8 to 13% *trans*-7, *cis*-9



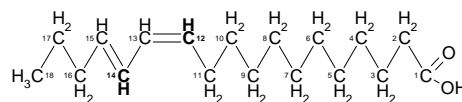
plus *trans*-8, *cis*-10,



1 to 2% *trans*-11, *cis*-13,



less than 1% *cis*-12, *trans*-14



and 5 to 9% total *trans/trans* isomers. Limited studies suggest that *cis*-9, *trans*-11 (figure at the top of the column) in beef fat is 60 to 90% of total CLA. **This same isomer comprises 71% of the CLA in human milk!**

Isomer Properties

We have mentioned that the saturated, monounsaturated and polyunsaturated fatty acids melt at different temperatures—the more saturated, the higher the melting point. The CLA isomers have different physical properties such as melting point and heat of evaporation. Since they have differing physical properties, it can be assumed, correctly, that they have different chemical and physiological properties. There is no need for us to recall any of the CLA isomers presented here. We should, however, note the differing special configurations. Those that contain a *cis* dou-

ble bond configuration are bent. Below is an exaggerated *cis* double bond on the left and a *trans* double bond on the right.



Trans acids (a mixture) can lie comfortably close to each other while the bent *cis* acids cannot. When the *trans* acids pack in, they form a solid fat. The *cis* acids are forced to stay removed from each other, so are oils. There are a lot of *cis* configured acids in vegetable oil. When they are hydrogenated chemically (hydrogens added to the double bonds), the double bonds that do not become saturated are in the *trans* form. This is the method by which oils are converted to semi-liquid and solid margarine.

What's Next

We will talk about neutral fats and touch on the “good for you” and “bad for you” fats as well as the ω6:ω3 ratios.

Rumors

“I have been referencing a lot of the information you provided at the School for several of our employees and clients. It has been valuable in understanding the livestock responses to forage conditions on the range. Thanks.”
Thank you, Jim Cornwell, NRCS, ID.

Schools In 2001

Mount Vernon, MO Feb 12 - 15, '01

Billings, MT May 8 - 11, '01

Idaho* June 4 - 7, '01

Colorado* November 6 - 9, '01

*Locations to be announced.

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¹ Dhiman, T.R. 2000. Conjugated linoleic acid: A food for cancer prevention. Feedstuffs. Vol 72, No 18:24.