ANSC/NUTR 618
Lipids and Lipid Metabolism
Fatty Acid Nomenclature
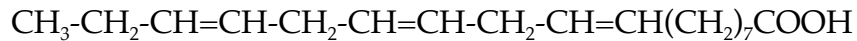

I. Nomenclature Systems

    A. Delta system

        1. Numbers from the carboxyl end (standard biochemical technique) to the first unsaturated carbon.

        2. *Example:* α-Linolenic acid -- 18:3 $\Delta^{9,12,15}$

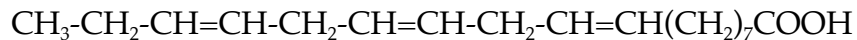methyl carbon   #1 carbon

$CH_3-CH_2-CH=CH-CH_2-CH=CH-CH_2-CH=CH(CH_2)_7COOH$

    B. "N minus" system

        1. Numbers from the terminal methyl carbon to the first unsaturated carbon, "substracts" those carbons, and places these numbers in parentheses.
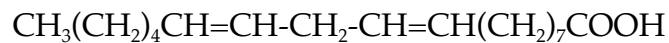
        2. *Examples:* α-Linolenic acid – 18:3 (*n*-3)

                #3 from methyl carbon

$CH_3-CH_2-CH=CH-CH_2-CH=CH-CH_2-CH=CH(CH_2)_7COOH$

                  Linoleic acid – 18:2 (*n*-6)

                  #6 from methyl carbon

$CH_3(CH_2)_4CH=CH-CH_2-CH=CH(CH_2)_7COOH$

        3. Fatty acid rules

          a. All double bonds produced by eukaryotes (plants and animals) are in the *cis*-configuration.

          b. All double bonds produced by eurkaryotes and three carbons apart (i.e., 1,4-dienes).

          c. All *trans*-double bonds are produced by isomerization of *cis*-double bonds.

              (1) By chemical hydrogenation

              (2) By ruminal hydrogenation

        d. All conjugated double bonds (i.e., two carbons apart) are produced by isomerization of *cis*-double bonds. This causes movement of the double bond from a 1,4-diene to a 1,3-diene.

  C. Omega system

      1. Numbers from the terminal methyl carbon to the first unsaturated carbon.

      2. *Example:* α-Linolenic acid -- 18:3 ω3.

      3. Position of other double bonds deduced by 1,4-diene rule.

II. Derivation of Trivial Names

  A. Latin

      1. Capro = goat. So, capric = anything smelling like goats (eventually used to indicate a group of fatty acids).

      2. Palm = from the *Palmaceae* (palm oil) family

      3. Olea = olive. So, oleum = oil

      4. Linum = flax. So, linoleum (or linoleic) = flax oil, which is high in both 18:2 and 18:3.

  B. Greek

      1. Stear = animal fat.

      2. No other common Greek names for fatty acids.

  C. Chinese characters

      1. Abura (oil) (Japanese)   油

      2. Shibo (animal fat) (Japanese)   脂肪