



DIGESTIBILITY OF FATS IN DAIRY COWS  
**How Much Do Digestibilities  
Vary Among Fat Sources?**

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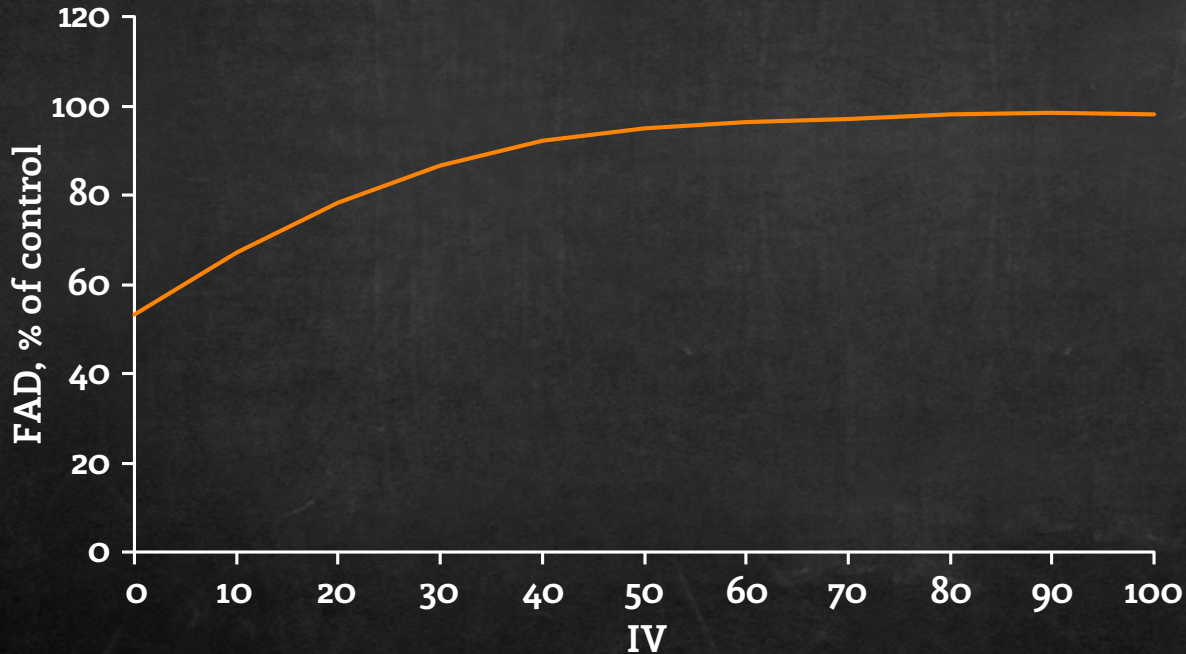




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## How Much Do Digestibilities Vary Among Fat Sources?

### Fat IV vs. Digestibility



Adapted from Firkins and Eastridge. 1994. J. Dairy Sci. 77:2357.



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### NRC 2001 Energy Values for Fats

|                         | EE   | True Digestibility | NE <sub>1</sub> 3X |
|-------------------------|------|--------------------|--------------------|
| Calcium Soaps           | 84.5 | .86                | 5.02               |
| Hyd. Tallow Fatty Acids | 99.2 | .79                | 5.41               |
| Partially Hyd. Tallow   | 99.5 | .43                | 2.97               |
| Tallow                  | 99.8 | .68                | 4.53               |
| Vegetable Oil           | 99.9 | .86                | 5.65               |



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### Requirements for Digestibility Data Set

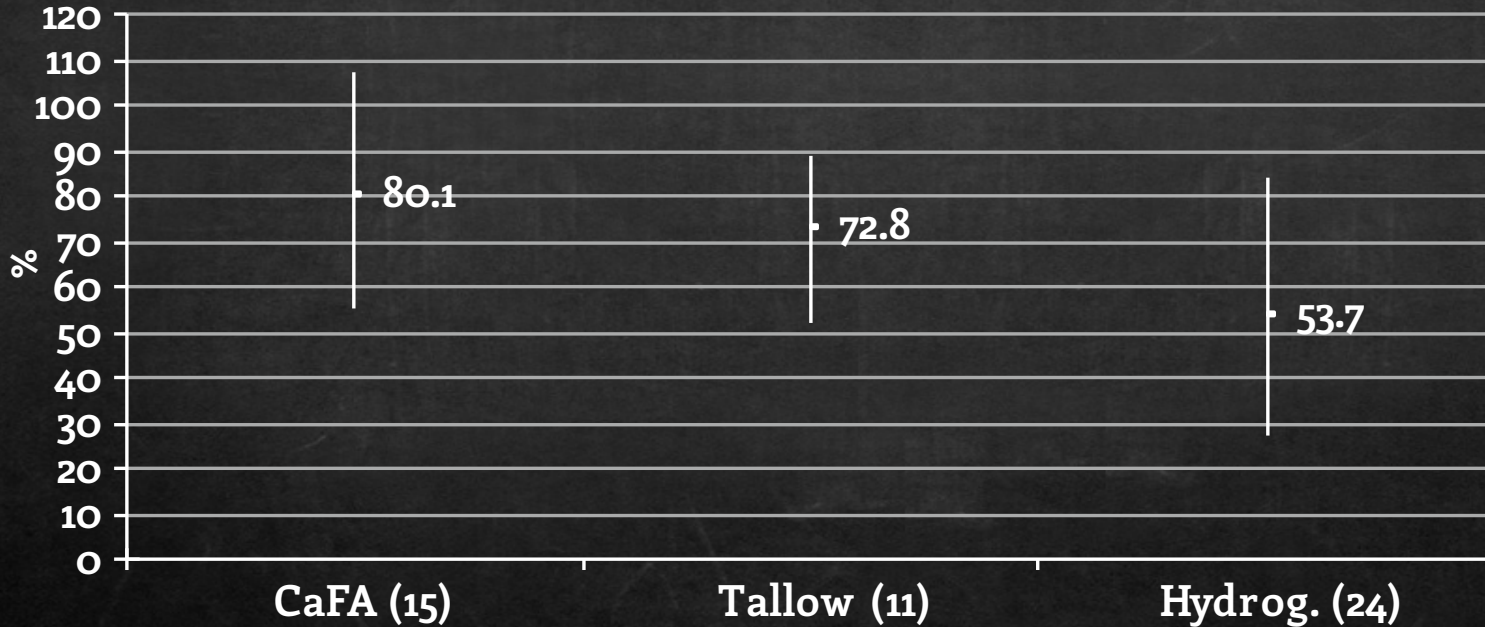
- Only dairy cows
- Only lactating cows
- Control diet without high fat feeds
- Fat supplement fed – not infused
- Fats not combined
- Fatty acids not ether extracts
- Results
  - ❑ 32 studies met all requirements
  - ❑ 45 studies rejected



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### Apparent Fatty Acid Digestibilities of Fat Supplements Determined by Difference





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From NDS

| Nutrient data entry |        |            |                          |             | Constants calculation    |  | Info | Cloning | User lists | Quick data entry | Mycotoxins |
|---------------------|--------|------------|--------------------------|-------------|--------------------------|--|------|---------|------------|------------------|------------|
| Carbohydrates       |        | Proteins   | Amino acids              | Fatty acids | Minerals/Bioavailability |  | INRA |         |            |                  |            |
| Restores            |        | FA profile |                          |             |                          |  |      |         |            |                  |            |
|                     | % DM   | % EE       | Rates (%/hr)             |             |                          |  |      |         |            |                  |            |
| EE                  | 80,600 |            | Lipolysis                | 6,000       |                          |  |      |         |            |                  |            |
| TFA                 | 80,100 | 99,380     | Adj Factor               |             |                          |  |      |         |            |                  |            |
| Glycerol            | 0,500  | 0,620      | Intestinal Digestibility |             |                          |  |      |         |            |                  |            |
| Pigment             |        |            | Lipolysed                |             |                          |  |      |         |            |                  |            |
|                     |        | % TFA      | % Intestinal             |             |                          |  |      |         |            |                  |            |
| C12:0               | 2,083  | 2,600      | 95,390                   |             |                          |  |      |         |            |                  |            |
| C14:0               | 3,605  | 4,500      | 75,060                   |             |                          |  |      |         |            |                  |            |
| C16:0               | 17,141 | 21,400     | 72,480                   |             |                          |  |      |         |            |                  |            |
| C16:1               | 7,049  | 8,800      | 72,000                   |             |                          |  |      |         |            |                  |            |
| C18:0               | 7,369  | 9,200      | 72,800                   |             |                          |  |      |         |            |                  |            |
| C18:1T              | 1,602  | 2,000      | 80,000                   |             |                          |  |      |         |            |                  |            |
| C18:1C              | 17,061 | 21,300     | 80,000                   |             |                          |  |      |         |            |                  |            |
| C18:2               | 4,886  | 6,100      | 83,000                   |             |                          |  |      |         |            |                  |            |
| C18:3               | 1,602  | 2,000      | 77,550                   |             |                          |  |      |         |            |                  |            |
| EPA                 | 6,648  | 8,300      | 77,550                   |             |                          |  |      |         |            |                  |            |
| DPA                 |        |            | 77,550                   |             |                          |  |      |         |            |                  |            |
| DHA                 | 6,889  | 8,600      | 77,550                   |             |                          |  |      |         |            |                  |            |
| Other LCFA          | 4,165  | 5,200      | 58,710                   |             |                          |  |      |         |            |                  |            |



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### From CPM

Optimized digestion coefficients for rumen free LCFA (RFLCFA) and non-lipolysed LCFA (RNLCFAs)

| LCFA   | RFLCFA | Feeds | Fats  | Hyd. Tallow | Whole-intact oil-seeds | Fish Meal | Megalac |
|--------|--------|-------|-------|-------------|------------------------|-----------|---------|
| C12:0  | 0.954  | 0.954 | 0.954 | 0           | 0                      | 0.818     | 0.954   |
| C14:0  | 0.751  | 0.486 | 0.486 | 0           | 0                      | 0.395     | 0.775   |
| C16:0  | 0.725  | 0.725 | 0.725 | 0           | 0.184                  | 0.725     | 0.833   |
| C16:1  | 0.640  | 0.640 | 0.640 | 0           | 0                      | 0.640     | 0.945   |
| C18:0  | 0.728  | 0.728 | 0     | 0           | 0                      | 0.728     | 1.000   |
| C18:1c | 0.893  | 0.669 | 0.669 | 0.561       | 0.156                  | 0.669     | 0.893   |
| C18:1t | 0.786  | 0.000 | 0.786 | 0.395       | 0                      | 0         | 0.786   |
| C18:2  | 0.830  | 0.776 | 0.830 | 0           | 0.607                  | 0.830     | 1.000   |
| C18:3  | 0.775  | 0.775 | 0.539 | 0.098       | 0.194                  | 0.652     | 0.858   |
| Other  | 0.587  | 0.587 | 0     | 0           | 0.587                  | 0.587     | 1.000   |



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### Rumen Inert Fats and Milk Fat

|                  | CON               | SFA <sup>1</sup>  | TAG               | CaFA              |
|------------------|-------------------|-------------------|-------------------|-------------------|
| DE, Mcal/d       | 66.8 <sup>a</sup> | 68.2 <sup>b</sup> | 68.9 <sup>b</sup> | 67.8 <sup>b</sup> |
| Milk, kg/d       | 41.3              | 42.5              | 42.4              | 42.0              |
| Fat, %           | 3.59 <sup>a</sup> | 3.94 <sup>b</sup> | 3.87 <sup>b</sup> | 3.89 <sup>b</sup> |
| Digestibility, % |                   |                   |                   |                   |
| Total FA         | 71.2 <sup>b</sup> | 69.5 <sup>b</sup> | 63.3 <sup>a</sup> | 76.3 <sup>c</sup> |
| Supplement       | -                 | 68.5 <sup>b</sup> | 56.3 <sup>a</sup> | 81.3 <sup>c</sup> |

<sup>1</sup>Diets contained 3% supplemental fat provided by saturated free fatty acids (SFA), triacylglycerides (TAG), or Ca salts of fatty acids (CaFA).

<sup>ab</sup> Means with different superscripts within a row differ.





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