# OBESITY, A MAJOR PUBLIC HEALTH PROBLEM

## THE USE OF A HIGH-FAT ANHYDROUS BUTTER DIET

### A GOOD EXPERIMENTAL MODEL FOR INDUCING OBESITY

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## OBESITY

A major public health issue, obesity is characterised by an excess of adipose mass, distributed over the whole of the organism and constituting a health risk. The World Health Organisation (WHO) recognised obesity as an illness in 1997. Obesity, today, is defined as pandemic (by default, since it is not a question of an infectious disease). Moreover, since 1997, a high increase in the prevalence of obesity in France is to be noted, with 14.5% of the population affected in 2009 (according to the ObEpi, Roche, 2009 Survey). In addition, the WHO estimates that the number of people affected by obesity in the world will have doubled between 2002 and 2015, going from 300 to more than 600 million. The dangerousness of obesity is to be identified especially in the fact that it represents a risk factor for cardio-vascular problems, arterial hypertension, certain forms of cancer, etc. It can be the source of type two diabetes and is also sometimes associated with depression, for which it can be at once the cause and/or the consequence. At present, the cause is often behavioral, with a growing level of sedentary lifestyles and the over-consumption of a diet that is too rich, especially in de-veloped countries. Effectively, in the industrialised world, the population tends to adopt hypercalorific and hyperenergy diets, in which the excess calories is largely owing to an in-crease in fat intakes. In order to maintain a normal weight, one needs to strike a balace between the nutritional in-take and the energy to be spent – what is referred to as an energy balance. In the case of hypercalorific diets, the scales lean on the side of intake, creating an imbalance that can lead to obesity.

| *C57BL6/J MICE N=10 PER DIET* | *ANIMAL'S WEIGHT (g)* |
|---|---|
| A03 | 29,7±0,52 |
| 260 HF | 41,3±2,71 |

## THE MURINE MODEL FOR NUTRITIONAL OBESITY

We use male mice from the C57Bl6/J strain of Janvier breeder (St Berthevin, France). On receipt, the mice are 4 weeks old and weigh between 17 and 18g. The mice are kept in inverted cycles of 12 hours of light/12 hours of darkness. With a view to inducing nutritional obesity, the U8978 version 19 High Fat Anhydrous Butter diet (SAFE) has been tested on 4 week-old mice for a period of 20 weeks, compared to mice nourished on a standard SAFE A03 (control) diet.

The animals on the HF Anhydrous Butter diet weigh 41.3±2.71 g compared to 29.7±0.52 for the control group mice, that is, an increase of 28.1 % ($p<0.001$).

Two mice in the HF Anhydrous Butter obesogenic dieting group did not appear to respond to the diet (29.9g and 30.1g), which explains why the variability is slightly less significant than in the control group. Effectively, in the HF group, the highest weight is 51.6g and the lowest is 29.9g. At the same time, the animals show a rapid weight gain (Figure 1). We can already see a significant weight difference as of Week 1 of the diet (20.47g for the HF diet vs 19.61g for the A03 diet) which rapidly peaks (25.57g for the HF diet vs 23.3g for the A03 diet after 4 weeks of the diet).

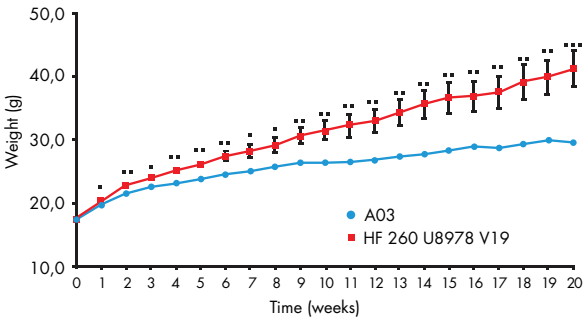


Figure 1: Effect of the HF Anhydrous Butter diet on weight gain in mice
The mice (n = 10 for each group) aged 4 weeks at the beginning of the trial were weighed every 2 days throughout the administering of the HF Anhydrous Butter diet, compared to mice nourished with the standard A03 diet (up to 20 weeks). The data is ± SEM. t-test averaged: standard (A03) diet vs HF Anhydrous Butter diet at the same time. *** $p<0.001$ ; ** $p<0.01$ ; * $p<0.05$

The functional tests such as the glucose tolerance test are reproducible and confirm the idea that the HF Anhydrous Butter diet is appropriate for inducing type II diabetes (Figure 2).

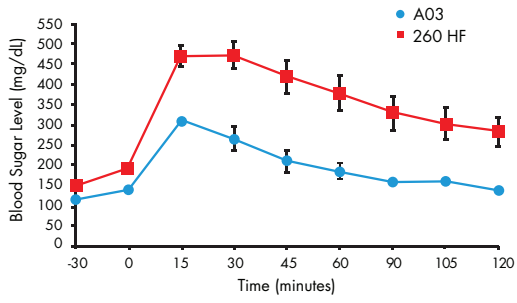


Figure 2: Glucose tolerance test carried out over the night period for the mice after injecting 1.5g of glucose/kg. After 20 weeks on the SAFE A03 or HF Anhydrous Butter diet (n = 10 for each group), the mice were made to fast for 16 hours. The blood sugar level was measured 30 minutes before the glucose injection, at the moment of the injection and 15, 30, 45, 60, 90, 105 and 120 minutes after the injection. The data is ± SEM averaged.

This diet, served in the form of croquettes that can be kept a long time, is easy to store and to use for studies into feeding in metabolic cages. In conclusion, although under our conditions two mice appeared to respond not so well as the others, this HF Anhydrous Butter diet does seem to be efficient and allows one to induce an obesity/type II diabetes phenotype.