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# II. Observations on animal fat and the causes of corpulency

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between them than between the horse and the afs, and muft be always more fruitful ; fo that if the horse were not known in his wild ftate, and if characterizing marks of a particular fpecies were not vifible in the dſhiggetai, on account of this great fimilarity, we might with much more reafon confider the dſhiggetai for the wild flock of our horse than the younger Gmelin confidered the wild horse as the common flock of the horse and afs\*, which, however, befides the moufe colour obferved by Gmelin, which is not always uniform, has nothing in common with the afs.

[ To be concluded in the next Number. ]

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II. *Observations on Animal Fat and the Causes of Corpulency.* By Dr. COINDET. From the Journal de Physique, Vendemiaire An. 7.

ANIMAL fat examined by the microfcope feems to exhibit yellowifh veficles, formed of a very thin and tranfparent pellicle, which contain an oily fluid. No pores can be obferved in it, and no perfon but Malpighi has been able to difcover what are called its adipofe ducts (*ductus adipofi*). In certain cafes, however, fat is abforbed, and in general it feems to undergo conftant changes : the fkins of the negroes after violent exercife exhale an oily odour.

The veficles of fat are different in different animals. Wolf of Peterfburgh obferved that the fat of a pullet is contained in veficles fmaller than thofe of any other animal : thofe of the goofe are larger, and ranged with more regularity. The next in order are thofe of man ; but, according to Wolf, the moft confiderable are thofe of the hog. Thefe veficles are contained in the interfices or fmall fpaces in the cellular

\* See Sam. Gottl. Gmelin's *Reife durch Ruſſland*, part i. p. 47 Compare, alfo, what I have ſaid of wild horses in my *Travels*, part i. p. 211, 272; part ii. p. 642, and ; art iii. p. 509.

tissue, but are not found equally dispersed throughout every part of the body. Fat is found in a pretty considerable quantity in certain cavities of the body, as in the orbits of the eyes, near the reins, in the epiploon, sometimes at the point of the heart, &c. In man there is none about the lungs, the penis, or the brain. Some is contained in the last-mentioned organ in the cold-blooded animals: in the sea-dog, the ray, and many other fishes, the fat is mixed with the parenchyme of the liver, to which it gives considerable bulk: in birds and animals that feed on vegetable substances, it is found around the reins. The fat of fishes is more liquid than that of carnivorous quadrupeds: that of frugivorous animals has more consistence than the fat of others.

The quantity of fat varies much according to the different classes of animals; and, if we compare the quantity of fat with the bulk of the body, it will be found that fishes exhibit the largest proportion; then amphibious animals, and then the frugivorous. The carnivorous present the least. But these are only general observations, which are subject to many exceptions.

All the uses of fat are not yet known; but we know that in some cases it becomes exhausted, and supplies the place of aliment. Thus, animals which remain in a state of torpor for several months without taking nourishment, lose their plump appearance; from which it would seem that this is a resource provided for them by nature. May it not perhaps serve to preserve animal heat? The circumstances which contribute to its formation are still more obscure, and have given rise to many ingenious ideas dignified with the name of hypotheses. One of the most probable is that of Dr. Beddoes\*, which appears to me to clear up many facts

\* Dr. Coindet has done little more than abridge from Dr. Beddoes's *Observations on Calculus*, &c. though he prefixes his own name to this paper, and thus casually introduces the name of the latter, as if his writings only tended to confirm, when, in fact, they are the foundation of the doctrines here brought forward. EDIT.

hitherto inexplicable, though it is subject to many exceptions, as every hypothesis must be. The foundation on which it rests is, that whenever there is a certain diminution of oxygen in the animal system, fat will be produced. The following observations seem to support this assertion: The chemical analysis of fat shows that six parts of it contain near five of carbon and one of hydrogen, and some sebatic acid. The fat parts of animals differ from the fleshy parts only in this, that the latter contain more oxygen and azot. By this is explained the change of muscles into a substance like spermaceti, as professor Fourcroy remarked in the burying ground of the Innocents at Paris. It has been observed also, that the fat augments at the expense of the muscles in the living body, and *vice versa*\*.

This want of oxygen considered as a cause of corpulency is indicated by the analogy which exists between obesity and the sea scurvy, which seems to be owing only to a gradual abstraction of a part of the oxygen in the system. The sea scurvy is never announced by meagreness; on the contrary, a fullness of the habit is the first symptom of that malady. Dr. Trotter observes, that when a negro grows rapidly corpulent, he does not fail to be attacked by the scurvy; from which, to make use of a comparison of Dr. Beddoes, it appears that corpulency is to the scurvy what cachexy is to the dropsy. All the symptoms of the scurvy prove that it arises from a privation of oxygen: thus the surface of the body is covered with livid spots, the arterial blood is very little florid, and, after death, the left auricle is found filled with venous blood, which Dr. Goodwin found in animals that had been deprived of life by oxygen. Dr. Lind says, that when death has been sudden, and that no effusion is found in the cavities of the body, the auricles and the ventricles are filled with blood, and especially the left side of the

\* Very fat hogs have scarcely muscle enough to perform locomotion.  
EDIT.

heart;

heart ; which is a very remarkable circumstance, since that side rarely contains much blood after death.

According to the experiments of Sauffure and Humboldt, it appears that the atmosphere of the high mountains contains less oxygen than that of the lower regions; and this explains why la Condamine was attacked with scorbutic symptoms on the summit of Pinchina. Much sleep and inactivity are powerful causes of corpulency. In that state respiration is less frequent, a smaller quantity of oxygen is absorbed, and the absorption of fat is diminished, while the secretion of it is continually taking place. Leanness is produced by a contrary state, that is to say, by the effect of exercise : more oxygen is then introduced into the system, and the fat is absorbed in common with the other fluids.

People in the country known very well from experience, that when they wish to fatten poultry they must keep them in darkness, and mix with their food substances proper for prolonging their sleep, such as tares or spirituous liquors\*. An observation which appears curious is, that the age when the secretion of fat is most considerable is towards the fortieth year ; a time when the arterial system ceases to act such a conspicuous part in the animal economy, either because it is then ossified, or in part obliterated, while the venous system, becoming more and more developed, seems to acquire that influence so considerable in old age. Do arteries the action of which is visibly diminished, furnish at that period less oxygen to the system ; and may not that be the cause of the corpulency of middle-aged people ?

It may be objected that children, whose venous system is not yet developed, have however a remarkable plumpness. But this difficulty has been resolved in the following manner : The venous blood when it arrives at the lungs undergoes there chemical changes, too well known to require to be

\* In Portugal, fowls are not only kept in the dark, but their feet are fastened to the floor, so as totally to prevent their walking. EDIT.

here particularized. It may happen that, according as respiration is more or less perfect, the blood may lose a greater or less quantity of carbon and hydrogen. In proportion as it loses less, the secretion of the fat will be more abundant : this then will afford an explanation of the enormous quantity of fat found in amphibious animals, fishes, &c. in which respiration is not so perfect, because, being surrounded by water, they are not in contact with so considerable a quantity of oxygen as animals that breathe in the open air. They retain then more hydrogen and carbon, which passing into the arteries, occasion that considerable secretion of fat, and probably produce that voluminous size of liver, found in fishes in which circulation is such that almost all the blood goes into the liver, either to operate there a secretion of fat or of bile, the constituent parts of which do not differ much from those of the former.

Children do not respire in the uterus, as the foramen ovale is not obliterated till towards the third or fourth year of their life, and sometimes later : they have for the same reason a very full habit of body. What appears to confirm this opinion are the observations quoted in the Medical Transactions of London, and those of Professor Sandifort of Leyden, of individuals remarkable for their corpulency ; in whom it was found, by dissection, that the foramen ovale was not closed up ; that is to say, that the greater part of the venous blood passed directly from the right into the left ventricle, to be transmitted into the aorta, and from thence into the whole system, without having undergone there any of those changes which are effected on the blood by respiration\*. The lungs in such individuals were diminished in size, and in a state of collapse, which indicated that they had not discharged all the functions of respiration. This theory seems to throw much light on the enormous size of the liver

\* To these causes may be added the frequent sleep of children, of times in an atmosphere of diminished purity. EDIC.

in a fœtus, and which no one hitherto has been able to explain.

Diseases of the liver, such as scirrous tumours, &c. generally attack people who are more or less corpulent. The blood of persons very plethoric, or very fat, is commonly of a darker colour and more viscous than that of lean people, which is generally very florid. The means of cure afford a very strong argument in favour of this hypothesis; for, though obesity be rarely the subject of medical treatment, yet some physicians have treated it like the scurvy, with vegetable acids, pulse, &c. as affording more oxygen. It has been remarked, that people who habitually drink cyder are more meagre than those who use beer, porter, or other liquors of the same kind.

There are some countries, the inhabitants of which are in general corpulent, as is the case in Holland, and some parts of England; while in others, as France, for example, the greater part of the inhabitants are thin. Does this arise from the difference of food, or is it not rather owing to the greater or less purity of the air? that is to say, to a greater quantity of oxygen contained in the atmosphere? The above facts appear to explain the different causes of obesity, and to throw great light on the means of curing various diseases, which have hitherto baffled all the efforts of medicine.

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III. *On the colouring Matter of vegetable Juices and the Action exercised on it by metallic Substances and their Oxyds, with a new Process for obtaining Lakes of more intense and solid Colours.* By Cit. GUYTON. Read in the National Institute 15 Vendem. An. 6.

LINNÆUS, the great naturalist of the north, said, that the red colour of vegetables announced in them the presence of an acid. It had been long observed, that the juice of the  
flower