

Item from New Scientist 3rd September 2011-09-16

Artificial Meat: The first lab grown sausage might be just six months away.

Comment by Prof Allan Bretag:

Of course meat is animal muscle and, if it could be made artificially, why couldn't human muscle also be made artificially? What a benefit to people with muscular dystrophies and many other neuromuscular disorders that would be! Indeed, the hope held for growing artificial meat/muscle in the laboratory or in factories has been around for many years.

Unfortunately, the problems associated with this remain immense. So far, strips of pig muscle 2.5 cm long and 0.7 cm wide have been grown from muscle stem cells in a laboratory in Maastricht, The Netherlands by Prof. Mark Post and his colleagues. But the strips are probably not more than a cell or two thick. This is because the tissue culture fluid that they need to grow in must flow over all the cells in a way comparable to blood capillaries providing fluids, nutrients and oxygen to real muscle and, of course, wastes need to be carried away, as well. Also, the full differentiation/maturation of muscle cells requires contact by nerve cells. This has rarely been achieved in the laboratory in tissue culture and certainly not on any large scale. Even scaling up the stretching process used in Maastricht to condition millions or billions of the muscle strips (to make a useful muscle) would constitute a nightmare. Additionally, muscle stem cells, like many other cells, do not reproduce themselves beyond a finite number of cell divisions and they require fetal calf serum or horse serum in their culture fluid. This introduces risks of transfer of animal infections and I don't know that anyone has muscle cells growing in a purely synthetic fluid.

It has been estimated that the current cost of producing enough primitive muscle cells of the kind prepared by Prof. Post to make one hamburger would be about \$350,000. At this rate, the cost of preparing enough muscle to replace that in an average 60kg woman would be more than \$5 million, ignoring the intricacies of blood supply, nerve connection and the mechanism of transplantation.

Consequently, it is likely to be some time before we get artificial meat and even longer before people with muscular dystrophy get new muscles by this means. Various kinds of genetic repair of their existing but deteriorating muscles look like a much better bet for them.

So far as artificial meat for food is concerned, what is never mentioned is that high concentrations of antibiotics are usually necessary in the tissue culture fluids to keep unwanted microbial bugs out. If the "meat" was contaminated with these it would probably be an even greater contributor to antibiotic resistance in its consumers than is the current practice of loading up meat animals with antibiotics.

Finally, to make meat for food, expressing the relevant animal muscle proteins in insect cells, such as SF9 cells, in purely synthetic tissue culture solutions in bioreactors, might be a better way to go. In either case, however, the "meat" would have no texture and, probably, little taste as these are provided in real meat by the interwoven connective tissue and fat. Perhaps texture could be introduced into artificial meat from vegetable sources in a similar way to how veggie-burgers are made now. An appetising taste might take even longer to be achieved.