EDITORIAL

When is a chimaera not a chimaera?

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'What a chimera then is man! What a novelty! What a monster, what a chaos, what a contradiction, what a prodigy! Judge of all things, feeble earthworm, depository of truth, a sink of uncertainty and error, the glory and the shame of the universe.'

Blaise Pascal (1623–1662) French Philosopher/Mathematician Fig. 1.

Most famous work: Pensées.

As haematologists we all know that radiation has a paradoxical effect on humans. Exposure to radiation can be detrimental and cause leukaemia and contribute to other malignancies. On the other hand, total body irradiation was successfully used by Don Thomas and colleagues as part of the conditioning therapy for allogeneic bone marrow transplantation.

Following the development of the 'atomic bomb' in Los Alamos during World War 11, Jacobsen et al. published results of mouse experiments in 1949 where they showed that a mouse would survive lethal doses of irradiation if the spleen (a haemopoietic organ in mice) was exteriorised and protected [1]. Lorenz got similar results by using bone marrow cells [2]. The importance of matching the donor and recipient was demonstrated by Barnes and Loutit [3] when they showed the prolonged survival of mice given syngeneic cells but a shortened survival in mice given non-matched cells, due to 'secondary disease'. We have discussed before the serendipitous discovery of 'runt disease' in mice by Uphoff [4]. This was shown subsequently to have morphed into acute or chronic Graft versus Host Disease (GvHD). Animals (mice initially) which had the haematopoietic system of the donor following haemopoietic cell transplantation, HCT (as it is now known) were called 'radiation' chimaeras. Following successful HCT, the recipient is known as a chimaera.

The chimaera, offspring of Echidna and Typhon, was a mythical Greek fire-breathing creature, with the head of a lion, the body of a goat and the tail of a snake. The chimaera was slain by Bellerophon Fig. 2 when he inserted a block of lead into its throat which melted and suffocated it. Measurement of the chimaeric status of human recipients of HCT has been found to provide useful information about disease progression e.g. an increase in the amount of recipient haemopoietic tissue may herald relapse of leukaemia [5] but it also may have implications for GvHD following HCT for severe aplastic anaemia [6]. In 1991 we described a method of detecting donor and recipient haemopoietic tissue [7] using polymerase chain reaction of polymorphic short tandem DNA repeats (STRs) although this has been superseded by fluorometric methods. Of course, there are many methods to measure chimaerism in recipients of allogeneic HCT, but looking at a long-term survivor the chimaeric status would not be obvious.

What has this got to do with wine? Quite a lot, really. Phylloxera, an aphid, almost wiped out the wine industry in Europe and many other countries in the late 19th and early 20th centuries. The aphid feeds on the roots of the vine causing swelling (galls). The infected root dies and the leaves turn yellow, wither and fall to the ground. Phylloxera can infest a vineyard from the soles of vineyard worker's boots or naturally spreading from vineyard-to-vineyard by proximity. However, the spread to Europe was probably due to importation of infected vines from America to fight oidium (powdery mildew) in the mid-19th century.

There are numerous articles, books, blogs etc written about phylloxera and it has been mentioned in an earlier BMT editorial [3]. I admit that reading about phylloxera can be very confusing, but the 'bottom line' is that American vines (*vitis tiparia and labrusca are* dominant on the east coast) are largely resistant to phylloxera, whereas vines (*vitis vinifera*) in other parts of the world (Europe) are not. Some countries/areas were not infected, notably Chile, parts of Australia, Spain, Portugal and Italy. However, in many countries it had a devastating effect. As an aside, it is interesting that many learned articles talk about symptoms of phylloxera infection. Perhaps some aphids can talk! Of course, they mean signs!

There were many confused people in Europe as to the cause of this devastating disease but suffice to say the cure, and there were many suggestions, consisted of grafting American rootstock onto European vines. As American vines were largely resistant to infection with phylloxera this proved to be successful Fig. 3. So, the vines you see in Europe are the result of hybridisation, but you would not know by looking at them. I'm afraid a little terminology is required at this stage. The rootstock is the root system of a vine with a part of the stem. The flowering part of another vine (called the scion) is grafted onto it. This is then grown as a whole new vine. Many vines can be grafted onto the same rootstock. Hybridisation of vines is when you pollinate one vine species with the flower of another. The hybridisation of vines is aimed at making the offspring of the two varieties a better vine in terms of resistance to disease, in this case, phylloxera.

The words chimaera and hybrid are often used interchangeably although technically they are different. Wikipedia calls the chimaera, a hybrid. Hybrids have intermediate features and each cell is a mix of chromosomes from the parental species. Chimaeras are a mix of genetically different cells to form a mosaic animal.

So, when you see a long-term survivor of allogeneic HCT or a beautiful vine, they are not what they seem, one may be a chimaera and the other probably a hybrid.

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The ideas and writing of this are entirely Shaun McCann's.

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Fig. 1 Blaise Pascal. Pascal studying the cycloid (a cycloid is a curve that is generated by a point on the circumference of a circle as it rolls along a straight line). Sculpture by Augustin Pajou (1730–1809). Public domain. Louvre Museum, Paris, France.

Fig. 2 Bellerophon. Bellerophon kills the Chimaera. National Archaeological Museum of Athens. Creative Commons Attribution-Share Alike 2.5 generic license.

Fig. 3 François Baco. François Baco. An early user of hybridisation to eradicate phylloxera. Wikipedia.

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COMPETING INTERESTS

The author declares no competing interests.

ADDITIONAL INFORMATION

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