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News

Shaking the family tree

Resolution is emerging from the gunsmoke surrounding the origin of mammals such as ourselves.

Henry Gee


Odd one out: carnivores are grouped with dolphins and whales, but rodents are closer to primates

Acrimonious debate has raged over the past decade between biologists seeking to clarify the evolutionary links between mammals as diverse as humans, elephants and bats. Now two reports[1],[2] published this week go some way towards untangling the branches of the mammalian family tree.

We humans, and most of the animals we're familiar with -- cats and dogs, cows and horses, rats and mice, bats and dolphins, elephants and rhinos -- are 'placental mammals'.

Despite an incredible variety of shape and size (blue whales and pygmy shrews are both placentals), all placentals share a distinctive set of traits. All incubate their young to an advanced state before birth, and have a host of skeletal and dental specializations in common.

But scientifically, this familiarity has not bred contentment. Biologists trying to reconstruct the evolutionary relationships of placental mammals using DNA and molecular evidence have often locked horns with scientists versed in the old-school approach, based on the careful study of bones, teeth and anatomy.

At last, some resolution is emerging from the gunsmoke. The two independent reports now claim to provide robust answers to the question of the branching order in the family tree of placental mammals.[1],[2]

One report comes from Mark S. Springer of the University of California, Riverside, and colleagues; the other, from a team led by Stephen O'Brien of the National Cancer Institute in Frederick, Maryland.

Although based on different gene-sequence information, both studies draw very similar conclusions. Both divide placental mammals into four great groups.

One group, the 'Afrotheria', includes elephants, aardvarks, sirenians, hyraxes and a few other groups. The Afrotheria grouping was revealed by molecular work several

years ago and, despite initial controversy, is increasingly well supported. The Afrotheria is thought to represent the last relics of a very early radiation in mammalian history specific to Africa.

The second, the 'Xenarthra', includes the sloths, anteaters and armadillos of South and Central America. A third contains primates (including humans) together with the rabbits, and rodents such as rats and mice. The fourth includes carnivores and most ungulates (cows, horses and so on), together with whales and bats.

These results are unlikely to settle all debates immediately, but they have some interesting consequences.

The first is that many adaptations seen in placental mammals, ranging from aquatic habit to flight, evolved many times independently. A second is that the two placental mammals that are the subject of genome-sequencing initiatives -- mice and humans -- share just one branch of the greater family tree.

In other words, the vast range of genomic diversity in placental mammals outside the group containing humans, primates and mice remains completely unexplored.

The placental mammals comprise most mammal species alive today. The other groups include the marsupials -- kangaroos, koalas and opossums -- once widespread but now largely restricted to Australasia, and the monotremes. These are the 'egg-laying' mammals, such as the platypus and a few species of spiny anteater from Australia and New Guinea, relics of an early flourish of mammalian evolution more than 100 million years ago, before the placentals appeared.

- **References**

1. Springer,M. Set al. Parallel adaptive radiations in two major clades of placental mammals. *Nature* **409**,610 - 6142001. | Article | PubMed | ISI | ChemPort |
2. O'Brien,S. J.et al. Molecular phylogenetics and the origins of placental mammals. *Nature* **409**,614 - 6182001. | Article | PubMed | ISI | ChemPort |