For centuries, scientists were confounded by an animal that seemed to look and act like a combination of a bird, a reptile, and a mammal. It has a bill like a duck and lays eggs but produces milk for its young. It lives in a burrow, has fur, and can make venom. We now know that this animal is called a duck-billed platypus. A platypus is a monotreme, a type of egg-laying mammal.

Excerpt from "Research Riddle Resolved"

1 Hundreds of years after the first sightings of the platypus, the animal still captures our imagination anew and irresistibly attracts the attention of science writers everywhere. The May 2008 *Nature* report detailing the DNA insides of the duck-billed platypus invited colorful tales from just about every mainstream media outlet.

2 But cuteness and weirdness aside, the platypus research results are a gold mine for medical researchers. The findings cement what may have seemed totally obvious but turned out to be a bit of a scientific surprise: platypus DNA is a patchwork of genes from reptiles, birds, and mammals.

Evolution Fusion

3 In other words, the platypus heritage is laid out in an evolutionary DNA tapestry that marks the time, hundreds of millions of years ago, when reptiles and mammals branched off the evolutionary tree.

4 So what? The platypus is nothing like a human, so what can its DNA tell us about people and the diseases we get?

5 Plenty, says an international team of scientists who did this work.

6 The platypus genome results are far more than confirmation of a scientific oddity. They provide researchers a window into a time in history when mammals became unique—gaining the ability to bear live young, produce milk for them, and grow a warm, furry coat.

7 That's important because our own, modern-day genomes are still a big mystery and researchers need much more information to be able to translate our genetic language into useful health knowledge.

8 One of the ways scientists can decipher meaning from within our 3 billion DNA "letters," or nucleotides, is to compare human genes with those from animals, to see what has been kept the same and what has evolved to be different. . . .

Same and Different

9 In an approach called comparative genomics, scientists compare the genome sequences of several species: human, mouse, and a wide variety of other organisms from single-celled fungi to elephants and, now, the platypus.

10 The goal of this research is to find regions of similarity and difference in order to better understand the structure and function of human genes.

11 Comparative genomics is directly related to evolution because all living things share a common ancestor. By using computer tools to examine genes that have been kept the same in many organisms over millions of years, researchers can locate signals that control how genes work. This information may translate into ways to understand, treat, and prevent human diseases. . . .

Chicken or Egg?

12 When researchers analyzed platypus DNA and compared it to that of chickens, snakes, and lizards, the findings traced the evolutionary path from birds and reptiles to mammals. They learned that the platypus lost most of its genetic ability to produce egg yolk—as compared to chicken genes. This suggests its departure from "chicken-ness."

13 But, through evolutionary change, the platypus gained the ability to make milk that is rich in nutrients. Platypuses have genes that make the milk protein casein: just like we do.

14 A male platypus can, like its ancestral snake and lizard cousins, produce venom. The platypus ejects this venom through special glands in its back legs. The evolutionary reason for maintaining such molecular weaponry isn't yet clear, but what is fascinating is that it appears nature mixed and matched together DNA pieces separately to create the venom genes in reptiles and monotremes like the platypus.

15 The scientific value of pinning genetics to physiological function—like milk production—is high. Such investigations may help medical researchers understand health issues related to reproduction and lactation. Although lactation is an ancient reproductive trait, mammals—including the platypus—are unique in their ability to produce milk that is extraordinarily nutritious, containing a rich blend of sugars, fats, and proteins.

16 More generally, though, studying how nature cuts and pastes gene modules gives scientists an inside scoop on how genetic changes relate to health and disease risk.

17 One thing is clear—the stunning blend of reptile, bird, and mammal puts the platypus in a class of its own, and it gives researchers much more: information about how mammals like us came about.

18 [Scientists'] genetic sleuthing of platypuses, chimps, fish, sunflowers—you name it—continues to teach scientists how millions of years of evolution progressed. This provides vital information to understanding the role of genes in the health and disease of mammals like us and our pets, and can also help preserve our rich and diverse planet.

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