

## Warm and Cold-Bloodedness in a Newer Perspective

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### Introduction

The following article is an opinion essay with a slightly different and newer perspective on the evolutionary phenomenon of warm and cold-bloodedness.

There are lot many articles on the said phenomenon and one by physician Dr. Howard Glicksman which is titled as 'Understanding temperature: Cold blooded vs. warm blooded animals' [1] is a treat to read wherein he describes what it means to be cold and warm blooded and what might be required for one to develop into the other. Dr Glicksman explains that being warm blooded has its own advantages like ability to support highly complex energy dependent organs like brain and maintaining a core temperature that is often far higher than its environment. Furthermore to maintain core temperature warm blooded ones uses more of the energy obtained from food as heat and this means requirement of much more food (often five to ten times higher) for survival. Also as per article conventional scientific wisdom says that warm blooded animals evolved from cold blooded ones. Little else is said about what viable transitions in this evolutionary conversion could have taken place and to convert a cold blooded animal into a warm blooded animal is like converting a model t-ford into Lexus etc.

Now coming to the present article and how the author views this fascinating journey of evolution of endotherm or warm-bloodedness with side by side discussing the differences between the warm blooded and cold blooded animals (they are strictly not cold blooded as they also have some thermoregulatory mechanisms [2] and should more appropriately be called as less warm blooded).

The difference between the two entities is being explained in a slightly peculiar way with the help of style of architecture of temples in Indian subcontinent. One would see an ancient type of architecture here which is seldom seen in other countries; that is the rock cut architecture [3]. In rock cut architecture (also sometimes called as monolithic architecture) construction starts from cutting a huge single solid natural rock from outside and proceeding inwards; this is in contrast to the more common structural architecture which are like any other modern buildings which starts from base and then moves outwards.

Now how this style of architecture relates to our current topic. See what is being suggested is that the primitive rock cut architecture is like cold bloodedness and modern structural engineering as warm blooded. In monolithic architecture requirement is of huge solid rock (just like the cold blooded reptiles including the now extinct dinosaurs) while structural architecture starts from inside with strong foundation (just like warm blooded humans with their core vital body organs including the mighty brain). Rock cut is relatively simple, requires fewer raw materials whereas structural architecture is complex and needs more resources. Similarly cold blooded animals have simple

body processes and lesser requirement of food while warm blooded ones have complex body processes and require lot of food. Huge rock cut structures are not made nowadays (like ectothermal dinosaurs having gone extinct) and have been symbolically replaced by smaller sculptures, carvings and statues (like cold blooded lizards, alligators, crocodile's etc. found in abundance today).

From this comparison above we would like to emphasise on one point that the rock cut is all about outside to inside construction while structural architecture is its reverse (i.e., inside out). Similarly biologists world over while studying on evolution of endothermy have been comparing the endotherms and ectotherms but here we would like to emphasise on the point (it is an assumption) that warm-bloodedness is a reversal (rather intelligent and complex reversal) of cold-bloodedness and would be presenting arguments below in support of this complex reversal hypothesis/assumption.

### Discussion

There is no denying the fact that primitive life was cold blooded (or less warm blooded). The progression towards full warm bloodedness in us humans would have gained momentum by the advent of agriculture/farming which ensured a continuous supply of food nearby; with food requirement met human beings could have converted their simple and less energetic body processes into more energy dependent complex processes. The emergence of more and more complex body processes with time seems to be the only progressive trend in evolution [4].

This can be explained with the help of shape of human red blood cells. Red blood corpuscles as already known are part of circulating blood which is flowing through the body in a complex and marvellous cardiovascular system. So how does RBC's of cold blooded animals look like; they are nucleated, oval and biconvex [5] and going by our reversal hypothesis the RBC's of warm blooded ones should be anucleated, round and biconcave. The fact is that they are exactly like that anucleated, round and biconcave as if the primitive red blood cells have been pushed in opposite or reverse direction forcefully (that force is actually energy and that energy generated from food).

This is like imagining that on a single road, each and every vehicle with little fuel is going in only one known direction. With time one intelligent vehicle having got lot of fuel gained momentum; changed gears from simple to complex reverse gear, also upgraded its body design to be more sophisticated and eventually becoming the supreme vehicle (the man). Before that another vehicle also tried a bit, with its energy converted the body size into a much bigger one but the basic design remained the same simpler one and eventually that vehicle (the dinosaur) met with accident (ice age) and faded away.

There are lot many other differences between the ectotherms and endotherms both grossly and microscopically. Even the names which

are stated below are opposites (or reverse) of each other. To name a few, respiration in ectotherms is positive pressure while its energy consuming negative pressure breathing in endotherms [6]. At sub cellular level metabolism is predominantly anaerobic in ectotherms through lactic acid/glycolytic pathway in cytoplasm whereas it is much more efficient aerobic metabolism in endotherms through Krebs or citric acid cycle in mitochondria of the cell [6-8]. At molecular level ectotherms transfer solutes across membrane through passive transport (simple diffusion, osmosis etc.) while endotherms do the same across the concentration gradient by active transport (sodium pumping) [6,7].

Let us now look at the importance of element sodium to body. It maintains blood volume, helps in conducting muscle and nerve impulses [9]. We get sodium easily through common salt; if it were not for discovery of salt in antiquity we would be eating much more meat for fulfilling our dietary sodium requirements as plant food contains less sodium [9]. However there are many groups including cardiologists advocating reduced consumption of salt for healthy heart in spite of the fact that sodium deficit can lead to blood volume depletion [10]. How a less warm blooded heart and body (due to less overall circulating blood volume) will be healthy is difficult to understand; rather we should advocate adequate salt consumption even in hypertensive so that they don't have to consume heavy bulky diets (which may lead to weight gain) for their sodium requirements and moreover blood pressure should be controlled by other means/medications.

Physicians are seldom interested in evolutionary biology while biologists are not fully concerned with the patient's disease and its pathology and hence there are lesser intensive studies on certain widespread illnesses like diabetes from evolutionary viewpoint. This disease ( diabetes) is no doubt linked to evolution because of its high prevalence and for which few theories like cryoprotective evolutionary adaptation [11] and food scarcity have been given in past. Here suggesting a different perspective on this disease (which would be disapproved anyway if found to be irrational but still should be articulated as Voltaire said disapprove of what you say but will defend your right to say it) that diabetes has added years to one's life. Will explain how having diabetes in past, definitely meant some more years to live with the help of a vehicle which is overloaded with fuel (like man with high glucose levels). This overloaded vehicle after wear and tear over a period of time got a flat tyre (prolonged illness like diabetes) rather than a catastrophic tyre burst (sudden cardiac arrest). Explaining it further, human cells or tissues which are fully saturated with glucose, if they are given more glucose, they are going to swell up and would eventually burst. However, historically instead of bursting; the body cells expelled their solvent (glucose along with fluid) and got shrunk (lost weight) but maintained their integrity and continuity. Indeed in diabetic ketoacidosis (fully treatable now with modern medicine) there is loss of intracellular fluid and is treated by giving fluid and dextrose/glucose along with other drugs [12].

Not going to explore the diabetes topic further as it's not the current priority. Human evolution favours survival of not only the fittest (Darwin's theory of natural selection) or survival of the adaptable

(Smithsonian's human origins theory) but is also linked to having a long productive life; the so called survival of the survivors [13]. Increased life expectancy offsets the disadvantage humans have of having the longest growing phase. Long childhood [14] as is being made to understand is likely because of the growth of slow growing brain and other complex body systems which are inherently linked to humans being warm blooded. Childhood is obviously followed by adulthood which is the peak of warm bloodedness (because of high energy levels with fully developed complex body systems) and energetic youth thereafter is followed by ageing which is its obvious decline.

## Conclusion

From the above discussion it can be safely argued that warm bloodedness is a complex phenomenon and such complexity to the extent that it is a reversal of simple phenomenon of cold bloodedness and linked to human evolution because of its ability to support highly efficient body systems including brain. Also it is now evolving with present technological revolution (or modern industrial revolution) and in near future may be by artificial revolution (from artificial intelligence to lab grown body organs etc.). Still a long way to go for the ultimate space revolution; this is also indicated by position of head as primitive man like all other quadruped animals used to look down, gradually becoming bipedal and raised his head [15] and in future would be looking up (reverse of looking down) during higher space conquest.

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