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Short Communication

Be careful for neglected diseases

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Neglected diseases boost (Nature, 457: 772, 2009), which will become greater threat to human health especially in tropical regions. In my opinion, it is the inherent result of climate warming. An allometrical scaling is suggested to support my opinion, this can also explain why swine flu does not affect pigs very much, but human beings fatally.

Key words: Global climate change, disease, temperature, allometrical scaling, swine flu, HIV, H1N1, virus.

INTRODUCTION

According to a piece of Nature news, many neglected diseases boost especially in tropical regions (Butler, 2009a, b). In my opinion, it is the inherent result of climate warming, which affects non-life and life fatally. Zheng and Bo revealed that global climate change makes deserts more frangible (Zheng and Bo, 2009), Kaspari, found that global warming might shrink ant workers by as much as a third (Kaspari, 2005). There is no effective way to alleviate the fevered earth except bamboos (Phyllostachys heterocycla var. pubescens), Zhou et al. (2009) pointed out that bamboo is one of best candidates for the control of global warming, it has an excellent capability of fixing carbon. A young bamboo of 28 days old can store 1.83 kg carbon (Zhou et al., 2009). In this paper, I will elucidate how temperature affects viruses using allometrical scaling (Kuikka, 2006, 2003; He and Huang, 2006; He, 2008; He, 2008, 2006).

ALLOMETRICAL SCALING

There are various methods arisen recently to explain various biological phenomena, among which the allometrical method (Kuikka, 2006, 2003; He and Huang, 2006; He, 2008; He, 2008, 2006) and E-infinity theory (Naschie, 2007, 2006) are the most powerful tools for discovery. In particular, using a blend of the methodology of allometrical scaling and E-infinity theory it was possible to solve various basic problems in biology (He. 2006).

Now we will figure out why neglected diseases become greater threat to human health using allometrical scaling. Considering a virus in a host animal, its metabolic rate, b, can be expressed as (He, 2008).

$$b \propto r^{(\alpha+\beta\Delta T)}, \qquad (1)$$

Where r is the character radius of the virus and α the fractal dimension of its surface, ΔT the temperature increase of the virus due to climate warming, β a constant.

When $\alpha = 2$ for sphere cells and $\beta = 0$, from Equation (1) we can obtain the well-known 3/4-scaling law in biology (Kuikka. 2006, 2003; West et al., 1999), revealing a fourth dimension of life (West et al., 1999; He, 2009, 2008).

$$B \propto M^{3/4}. \qquad (2)$$

Where B is the basal metabolic rate and M is the body mass.

When Equation (1) is used for brain cells, fifth dimension of life can be discovered (He and Zhang, 2004; He, 2006). Generally the fractal dimensions for a virus are larger than 2, the higher, the more fatal, see explanation in Ref. (He, 2008).

The basal metabolic rate of a virus colony in an infected organ or tissue, B_{virus} scales allometrically with respect to its colony mass, M_{virus}, in the form

$$B_{virus} \propto M_{virus}^{\alpha_0+\beta_0\Delta T} \qquad (3)$$

Where α_0 is an allometric exponent that varies with different viruses and it follows, $\alpha_0 > 3/4$, $\alpha_0 + \beta_0 \Delta T \le 1$. Derivation of Eqution (3) is similar to that in Refs. (He and Huang, 2006; He, 2008, 2006). By a simple fractal analysis (He and Huang, 2006; He, 2008, 2006), we have approximately

$$\alpha_0 + \beta_0 \Delta T = \frac{1+\alpha+\beta\Delta T}{2+\alpha+\beta\Delta T} = 1 - \frac{1}{2+\alpha+\beta\Delta T} \quad (4)$$

which is valid for the case $\alpha \approx 2$ and $\beta << 1$.
The life-span of virus colony can be expressed as

$$L_{virus} \propto M_{virus}^{1-(\alpha_0+\beta_0\Delta T)} \quad (5)$$

Equation (5) can explain global warming shortens life-span of small animals greatly. When an animal, e.g., a sheep, is in a serious motion, body temperature increases greatly. An effective way to cool the body is to transmit heat to its environment through wool. The hierarchical structure of wool fibers enables remarkable thermal conduction efficiency (Fan et al., 2008) and it is interesting that the fractal dimensions of the wool are close to the golden mean value, showing the optimal fractal character of wool fibre.
To see the effect of temperature on metabolic rate, we differentiated equation (3) with respect to T:

$$\frac{\partial B_{virus}}{\partial T} \propto \frac{B_{virus} \ln M_{virus}}{(2+\alpha+\beta\Delta T)^2} \quad (6)$$

Where $\Delta T = T - T_0$, T_0 is body temperature of the host animal.

From Equation (6), we can see, for tropical animals including human beings or for a warm-blooded animals, the increase of environment temperature leads to less ΔT and greater increase of the basal metabolic rate of the virus colony. Global warming increases the metabolic rate (Equation (1) or Equation (3)), as a result, shrinks its size (He, 2007), shortens lifespan (Equation (5)) and accelerates evolution (He, 2007), especially for tropical animals including human beings and for warm-blooded animals.

DISCUSSION AND CONCLUSION

For any life, we have

$$\frac{\partial B}{\partial T} \propto (\alpha_0 + \beta_0 \Delta T) B \ln M \quad (7)$$

or

$$B = B_0 + \left[\alpha_0 + \beta_0 (T - T_0)\right](T - T_{environment}) B \ln M \quad (8)$$

Where B_0 the basal metabolic rate without global warming; $T_{environment}$ is the environment temperature, T_0 is the body temperature. For cold-blooded (ectothermal) animal or plants, we have $T_{environment} = T_0$.

Due to the increase of temperature, $\Delta T > 0$, virus colony becomes more metabolically active. Some viruses were harmless when $\Delta T = 0$ (before global warming) and they will become more and more fatal to human heath due to global warming.

Due to high evolution rate of viruses, some new virus species will finally accustomed to a hotter environment in a very short time, some viruses parasitized only in animals with lower body temperature than that of human beings (such as elephants) will affect human health greatly and some human viruses (e.g. HIV) will be transmitted to animals with higher body temperature (such as monkeys). As it is well known that HIV rarely affects monkey, possible explanation is that the body temperature of, e.g., Japanese monkeys (Macaque Fuscata), is 38.6℃, higher than that of human beings (He, 2008). Under such a hot condition, compared with the host cells in monkey, HIV becomes metabolically inactive, as a result it is harmless to monkeys.

Similarly the body temperature of pigs is higher than that in human being, it is 102.5℉ or 39.1℃ (http://www.goats4h.com/Pigs.html). This is why swine flu (Butler, 2009) does not affect pigs very much, while affects human beings fatally. This is an explanation of 2009 swine flu outbreak.

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