CURRENT ONCOLOGY
A Canadian Cancer Research Journal

Crocodiles and alligators: physicians' answer to cancer?

The Editor
Current Oncology
17 December 2018

Despite advances in therapeutic approaches and supportive care, cancer remains a significant burden on human health. According to the International Agency for Research on Cancer, the number of new cancer cases and cancer deaths were 18.1 million and 9.6 million respectively in 2018—numbers that are expected to rise to 21.7 million and 13 million by 2030, highlighting the need to identify novel anticancer therapies.

Vertebrates such as crocodiles and alligators can withstand high levels of radiation, reside in unsanitary environments, scavenge on rotten meat or other germ-infested diets, and be routinely exposed to heavy metals. They are among the few species to endure the catastrophic Cretaceous–Paleogene extinction event. But such species have rarely been reported to develop cancer. It is unclear how species such as the crocodile can survive up to 100 years without developing cancer, all the while being exposed to noxious agents that are detrimental to *Homo sapiens* and that are well-reported to be causes of cancer development. We have therefore recently postulated that such species have established mechanisms to defend themselves from developing cancer[1]. In support, our recent studies showed that the organ lysates of crocodiles exhibit potent anticancer properties[2].

Two logical reasons potentially explain those findings:

- Animals such as crocodiles and alligators living in polluted environments have evolved a strong immune system against cancer development
- Gut bacteria in these animals produce one or more antitumour molecules to thwart cancer

Both reasons ought to be explored to determine the origin of anticancer molecules in the crocodile.

In support of reason 2, the gut microbiome is well known to play a significant role in regulating the behaviour and health of its host[3–5]. In recent years, there has been a marked increase in studies of the human microbiome, and it is shown to provide protection against a range of disorders such as inflammatory bowel disease, systemic metabolic disease (type 2 diabetes and obesity), atopic eczema and allergic disease, neurodevelopment disorders such as autism spectrum disorders, and schizophrenia. It also exhibits beneficial properties against cancer[3–5]. Notably, *H. sapiens* is just one species among millions of others, and we are a relatively new addition to the planet. Other species such as the crocodile and alligator have shown the ability to adapt, evolve, and survive successfully over millions of years, suggesting that we ought to learn from those species.

Given routine exposure to carcinogenic materials, it is intriguing that animals such as crocodiles and alligators do not develop cancer and have a prolonged lifespan of up to 100 years[1,2]. Even with exposure to stressful environments and carcinogenic materials, those species thrive under conditions that are considered detrimental to *H. sapiens*. For example, our preliminary work has shown that the microbial gut flora of the crocodile exhibits remarkable anticancer properties. Because the crocodile gut microbiome remains unexplored, we here propose to identify molecules from the gut microbiota of crocodiles and to study their effects on cancer and other disorders. This hypothesis-driven research is timely and topical, and it is imperative to research animals such as crocodiles as an untapped source of pharmaceutical drug leads for novel anticancer molecules. Additionally, it would be interesting to undertake future cancer epidemiology studies in communities in which crocodile meat or blood form part of the diet as a staple food.

Naveed Ahmed Khan BSc MSc PhD
Morhanavallee Soopramanien BSc (Hons)
Ruqaiyyah Siddiqui BSc MRes PhD
Department of Biological Sciences
Faculty of Science and Technology
Sunway University
Petaling Jaya, Selangor, Malaysia

CONFLICT OF INTEREST DISCLOSURES

We have read and understood *Current Oncology*'s policy on disclosing conflicts of interest, and we declare that we have none.

REFERENCES

1. Siddiqui R, Mansur Ali S, Khan N. Do crocodiles and alligators hold the key to treat cancer? *BMJ* 2016;354:i3763.
2. Siddiqui R, Jeyamogan S, Ali SM, Abbas F, Sagathevan KA, Khan NA. Crocodiles and alligators: antiamoebic and antitumour compounds of crocodiles. *Exp Parasitol* 2017;183:194–200.
3. Lin L, Zhang J. Role of intestinal microbiota and metabolites on gut homeostasis and human diseases. *BMC Immunol* 2017;18:2.
4. Nicholson JK, Holmes E, Kinross J, *et al*. Host-gut microbiota metabolic interactions. *Science* 2012;336:1262–7.
5. Clarke G, Stilling RM, Kennedy PJ, Stanton C, Cryan JF, Dinan TG. Minireview: gut microbiota: the neglected endocrine organ. *Mol Endocrinol* 2014;28:1221–38.

Correspondence to: Naveed Ahmed Khan, Department of Biological Sciences, Faculty of Science and Technology, Sunway University, Selangor 47500 Malaysia.
E-mail: naveed5438@gmail.com **DOI:** https://doi.org/10.3747/co.26.4855

 © 2019 Multimed Inc.