Iran J Parasitol: Vol. 18, No. 2, Apr-Jun 2023, pp.275-278

Tehran University of Medical Sciences Publication
http://tums.ac.ir

Iran J Parasitol

Open access Journal at
http://ijpa.tums.ac.ir

Iranian Society of Parasitology
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Letter to the Editor

The Potential Breakthroughs with ChatGPT in Parasitology

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Received 14 May 2023
Accepted 26 May 2023

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Dear Editor-in-Chief

Since the release of ChatGPT in November 2022, it has had a significant impact on various scientific fields (1-4), including education, writing, research, case reports, clinical consulting and coding. Articles addressing the benefits, limits, and applications of ChatGPT are rapidly being published. ChatGPT is an artificial intelligence (AI) model developed by OpenAI based on a generative pretrained transformer (GPT) architecture. The transformer architecture that underpins ChatGPT is designed to recognize patterns, make decisions, allowing it to process large amounts of data, and comprehend word relationships. ChatGPT is a conversational version of a large language model (LLM) that has been trained from massive text datasets to generate human-like response.

ChatGPT has several inherent limitations. First, current version of ChatGPT was trained on a vast dataset containing text from various sources on the Internet until September 2021 (4). Second, one of the biggest problems with ChatGPT is hallucinations, which can lead to the generation of inaccurate, irrelevant, or nonsensical responses (Fig. 1). This is because ChatGPT essentially predict the most likely word or sequence of words based on probabilities learned from their training data (2). Currently, the only solution is user-awareness and vigilance, such as fact checking. Third, ChatGPT can receive only textual data as input prompts. Thus, a future version should be developed to handle multi-modal input (text, image, audio and video), which will enable us to use microscopic images for parasite identi-

fication and to assist in the medical note taking. Effective video handling is crucial in diagnostic parasitology to achieve accurate diagnoses in three-dimensional reconstruction of parasites (5).

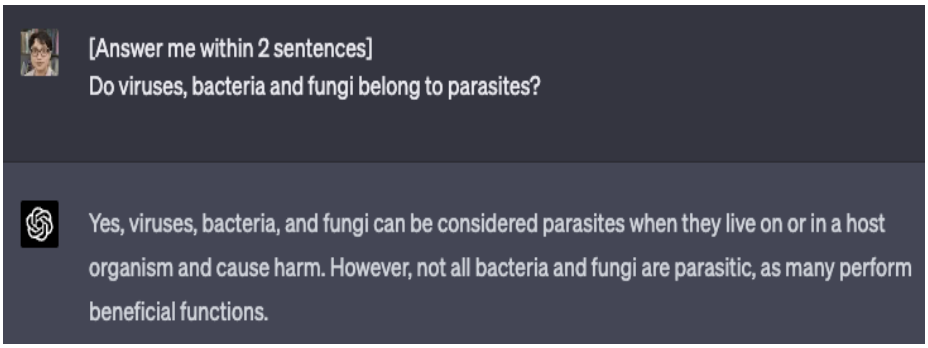

Fig. 1: An inaccurate answer from ChatGPT demonstrates the importance of precise queries and non-overreliance

Despite its inherent limitations, ChatGPT can revolutionize research and education, because it is designed to handle a wide range of general-purpose questions and tasks. ChatGPT can quickly generate responses or answers to tasks or questions, saving time and allowing more time to be spent on valuable work. ChatGPT is an outstanding tool for extracting fundamental information and clarifying concepts. In this era of extraordinary growth in parasitological publications, it is becoming difficult to summarize information and obtain suitable answers to important clinical or research questions. Both junior and senior parasitologists face these challenges; juniors need assistance in comprehending intricate ideas, while seniors should acquaint themselves with new fields from tons of information when addressing multidisciplinary issues.

The integration of ChatGPT with parasitological research has the potential to accelerate the discovery of novel treatments and diagnostic techniques for parasitic diseases. ChatGPT can aid parasitologists in generating new hypotheses, analyzing data, and identifying connections between seemingly unrelated findings. Recently, Auto-GPT (6) was introduced as an AI-based automatic service that automatically and iteratively performs all the steps required to achieve our goal. This method can be applied to review a large number of research articles for systematic reviews or meta-analyses.

The potential impact and role of ChatGPT have been addressed in parasitology education (1). ChatGPT was evaluated as an ordinary college student while answering the parasitology questions without additional training. The author reported that ChatGPT made two fatal errors. First, ChatGPT overlooked the common occurrence of *Spirometra mansoni* and incorrectly identified the host range of *Echinococcus granulosus* when queried against the most common tapeworms found in cats in Sydney, Australia. Second, ChatGPT encountered difficulties with false-positive cases compared with false-negative cases in canine heartworm diagnostics. Nonetheless, the author suggested that imperfections of ChatGPT could be beneficial for parasitology education, by discouraging overreliance on it. It serves as an excellent catalyst for group tutorial sessions, where initial learning objectives can be addressed by ChatGPT and students can then critically evaluate and verify information using primary sources (Fig. 2).

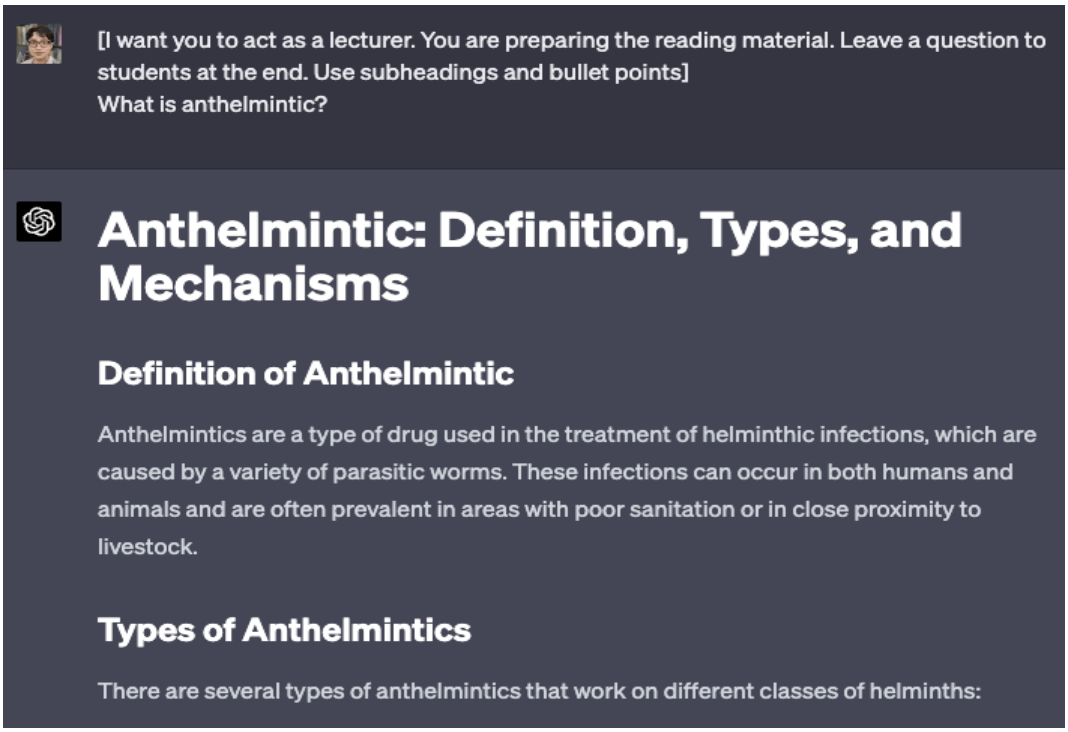

Fig. 2: ChatGPT's capacity as a teaching tool by providing learning assistance

Many LLMs have evolved into different versions, with each version becoming more advanced and capable, such as ChatGPT, Microsoft Bing AI (https://www.bing.com/), Google Bard (https://bard.google.com/) and Meta-LLaMA (7). Therefore, the specific language models tailored to parasitology could provide unprecedented access to specialized knowledge and insights for the parasitology community. To the best of our knowledge, GPT-3 (8) and Alpaca (9) (fine-tuned models of Meta LLaMA) could be fine-tuned for parasitology-related fields. For example, Yunxiang et al. introduced ChatDoctor, which is fine-tuned based on the LLaMA model using 205 K doctor-patient conversations (10). ChatDoctor enhanced the understanding of patient needs, provided valuable advice, and quality of patient care and outcomes by achieving higher accuracy (91.3%) than ChatGPT (87.5%). Thus, a new fine-tuned model can become more accurate and responsive for understanding and answering queries related to parasitology.

The future of ChatGPT in parasitology appears promising, with several potential applications that could revolutionize education, research, and clinical practice. Parasitologists should pave the way for a more collaborative, efficient, and impactful future by remaining informed of the latest developments and embracing the opportunities provided by LLMs. The exploration of ethics and integrity in research and education involving AI-based LLMs such as ChatGPT should be a focal point in future studies.

Acknowledgements

This work was supported by the National Research Foundation of Korea (NRF) funded by the Ministry of Science, ICT & Future Planning (grant no. NRF2022R1A2C1093376).

Conflict of Interest

Non-declared.

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