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Grande Área: Ciências da Saúde e Ciências Biológicas

PROFICIÊNCIA EM LEITURA EM LÍNGUA INGLESA

MATHS BECOMES BIOLOGY'S MAGIC NUMBER

By Tom Feilden, Science correspondent, Today programme
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"If you want a career in medicine these days you're better off studying mathematics or computing than biology."

This pithy aside was delivered by Sir Rory Collins, the head of clinical trials at Oxford University, in the middle of a discussion about the pros and cons of statins.

It is a nice one-liner, but I didn't think much more about it until a few days later, when I found myself sitting in a press conference to mark the launch of a new initiative on cancer.

Rubbing shoulders on the panel with the director of the Institute of Cancer Research, Professor Paul Workman, was a scientist I didn't recognise, but it soon became clear this was exactly what Sir Rory had had in mind.

Dr Andrea Sottoriva is an astrophysicist. He has spent much of his career searching for Neutrinos - the elusive sub-atomic particles created by the fusion of elements in stars like our sun - at the bottom of the ocean, and analysing the results of atom smashing experiments with the Large Hadron Collider at Cern in Geneva.

"My background is in computer science, particularly as it applies to particle physics," he told me when we met at the ICR's laboratories in Sutton

NEW ERA

So why cancer? The answer can be summed up in two words: big data. What Dr Sottoriva brings to the fight against cancer is the expertise in mathematical modelling needed to mine the vast treasure trove of data the information revolution has brought to medicine.

"The exciting thing is that we can apply all the new analytical techniques we've developed in physics to biology," he says.

"So we have all these new quantitative technologies that allow us to process an enormous amount of data, and all of a sudden we can start to apply that to implement the paradigm of physics in biology."

Of course, applying maths to solve biological problems is not entirely new. But it is only now, according to Sir Rory Collins, that the big data revolution is transforming medical science and ushering in a new era of bioinformatics.

"The big data era we're in provides extraordinary opportunities to understand the determinants of a range of different health conditions," says Sir Rory.

"The availability of data is unsurpassed, the ways of manipulating that data are also unsurpassed and so are the opportunities to work out what's going on and how to avoid disease."

'DATAGEDDON' WARNING

But there's a problem. The vast data sets that give bioinformatics its power are also its Achilles heel.

The Professor of Science and Society at Arizona State University, Daniel Sarewitz, warns of "datageddon" - over-enthusiastic researchers risking being set adrift on a sea of irrelevant information.

"If mouse models are like looking for your keys under the streetlamp, big data is like looking for your keys all over the world just because you can," says Professor Sarewitz.

The epidemiologist Professor Liam Smeeth agrees. If researchers aren't very disciplined about what they're looking for, he argues, they can quickly disappear down rabbit holes and blind alleys.

"The analogy is like someone firing an arrow at a wall," he says. "They fire at a big blank wall and then go up and draw a target around the arrow and say we've hit bullseye.

"What you need is to be doing is precise science and to be firing at a pre-specified target".

The answer, according to Dr Sottoriva, may be to approach big data like a grandmaster approaches chess.

To use mathematical modelling to understand and decode the rules of the game cancer is playing.

"What grandmasters do is to predict the moves of the opponent," he says. "If we can decode the complexity and make predictions about what cancer will do three, four moves ahead, then we can develop really effective treatments based on a solid mathematical framework."

Source: http://www.bbc.com/news/science-environment-37630414

Após a leitura do texto, responda às seguintes perguntas:

1) Que tipo de contribuição Dr. Sottoriva e outros cientistas de sua área podem trazer aos estudos sobre o câncer (parágrafos 7 a 9)?

R: Sua perícia em lidar com um grande volume de dados e modelos matemáticos de análise recém desenvolvidos.

2) Por que Sir Rory Collins fala em "nova era da bioinformática" (parágrafos 10 a 12)?

R: Porque, segundo ele, a grande quantidade ilimitada de dados disponíveis da rede fornece oportunidades extraordinárias (enormes) para compreender os determinantes de um grande número de diferentes problemas de saúde e como evita-los.

3) Qual é o principal problema com esta abordagem apontado pelo Prof. Daniel Sarewitz (parágrafos 14 a 16)?

R: O grande número de informações disponíveis inclui um grande número de informações irrelevantes que podem facilmente confundir o pesquisador, levando-o a becos sem saída e atrasando seu trabalho.

4) De que maneira Dr Sottoriva sugere que se pode contornar este problema (parágrafos 19 a 21)?

R: Ele sugere que trate os dados como um grande mestre enxadrista (de xadrez), ou seja, utilizar os modelos matemáticos para entender e decodificar as regras do jogo (o funcionamento) do câncer e, a partir daí, prever os próximos movimentos (etapas da doença) para desenvolver tratamentos eficazes.

5) Relacione as palavras abaixo com seu significado no texto:

A	one-liner (par.3)	E	perdido
B	trove (par. 7)	C	insuperável
C	unsurpassed (par. 12)	D	fraqueza
D	Achilles heel (par. 13)	A	Piada
E	adrift (par. 14)	B	descoberta