

科目

外国語(英語)

医学部医学科

注 意

1. 開始の合図があるまで、この問題冊子を開いてはいけません。
2. 問題は1ページから9ページにわたっています。問題冊子に不備がある場合は、直ちにその旨を監督者に申し出てください。
3. 解答用紙は4枚で、問題冊子とは別になっています。解答は、すべて解答用紙の所定の欄に記入してください。指定された解答用紙以外に記入した場合は、評価(採点)の対象としません。
4. 受験番号は、4枚の解答用紙のそれぞれの上部の欄に記入してください。
5. 解答用紙は持ち帰ってはいけません。
6. 下書用紙には、下書き用のマス目を書いてありますので、活用してください。
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実施年月日
31.2.25
富山大学

1 次の文章を読み、問いに答えなさい。

Should she change the dose of **steroids***? Administer a **diuretic***? Remove the feeding tube? Dr. Rachel Greenberg makes hundreds of crucial decisions while walking through the dimly lit bays of the **neonatal*** intensive care unit (NICU) at Duke University Medical Center in Durham, North Carolina. As she checks on the little ones entrusted to her care, some babies become restless in open baby beds beneath mobiles emitting soothing tones; the smallest, weighing less than half a kilogram, sleep in cots of clear plastic. In the corners, computer monitors silently shout messages such as “ (A) ”

Near the end of Greenberg’s rounds, the young neonatologist visits one of the newest arrivals, a baby girl with **mahogany*** skin and thin black hair, recently transferred from a community hospital. She was born 4 weeks too early, and though she’s doing better than most in the NICU, a note in her chart concerns Greenberg. Doctors at the community hospital had given the baby antibiotics without testing for an infection. Greenberg wonders whether the drugs were necessary. She had run a **blood culture*** herself and found no bacteria. Maybe the baby never had an infection. Or maybe she had, and the antibiotics were working. With no way to know, Greenberg continues the medication.

Like that baby, the vast majority of the nearly half-million infants born prematurely in the United States are given antibiotics, even without evidence of infection. Many premature infants are kept on the drugs even after blood tests say they are not infected. Yet that practice, once considered the best way to protect a hospital’s most vulnerable patients, is now being challenged. “ (D) ,” says Josef Neu, a neonatologist at the University of Florida in Gainesville.

Some studies suggest that even [certain / while / fight / infections / helping], those drugs may encourage others by wiping out an infant’s developing **gut microbiome*** — those trillions of resident microbes with functions as diverse as **synthesizing*** vitamins and supporting our **immune systems***. By disrupting that microbial ecosystem, blanket antibiotic dosing of babies, particularly premature ones, may promote a host of problems later in life, such as **asthma*** and **obesity***. And recent research indicates that long after premature babies leave the NICU, they can hold many antibiotic-resistant microorganisms, potentially endangering not only themselves, but also the wider population.

In all corners of medicine, doctors are waking up to the dangers of antibiotic overuse. But change is coming slowly to the NICU. Another message that pops up on the monitors at Duke is: “ (H) ” Yet many neonatologists hesitate to alter their habits, unable to shake the fear that a baby may die on their watch. “We are working to change our perception . . . to

fight the belief that antibiotics are always the safe thing to do,” Greenberg says.

Neu hopes to provide hard evidence with a small clinical trial:⁽¹⁾ A random selection of premature infants who would have been given antibiotics automatically will instead be placed in a nontreatment control group. For 2 years, his team will track their microbiomes and health. Some of Neu’s colleagues feel uneasy about withholding antibiotics, but he says answers are needed. “ (J) This is, I think, one of our biggest questions in neonatal intensive care right now.”

Today, babies born as early as 28 weeks routinely survive, as do more than half of those born at 24 weeks although often with significant disabilities. Much of the credit goes to antibiotics, which have prevented infections that a premature infant’s immature immune system could not have fought on its own. Those successes spurred a steady increase in routine antibiotic use in the NICU. At last count, three of the top four drugs prescribed in the NICU were antibiotics.

Over time, however, scientists began noticing that antibiotics can increase babies’ risk of the very problems the drugs aim to protect against. In a seminal 2009 study in *Pediatrics**, for example, Greenberg’s colleague Michael Cotten showed that each additional day of antibiotics significantly increased the odds that a premature infant would develop a serious illness, **neerotizing enterocolitis***, or die.

Researchers are still debating when the first microbes colonize us — before or during birth — but Greenberg and many others worry that early use of antibiotics in infants disrupts the establishment of those indispensable residents. The gut microbiome is practically an organ itself, weighing about as much as the liver. It is thought to play a critical role in priming the immune system, and it produces just as many **neurotransmitters*** as the human brain. Genetic and environmental factors, including antibiotics, shape its makeup early in life. Then, around age 3, a **quasi**-*stability sets in and we are “stuck with that architecture,” says Gautam Dantas, a microbiologist at Washington University in St. Louis, Missouri.

Dantas recently began tracing those dynamics in premature babies, whose microbiomes⁽²⁾ are just being established. In **stool*** samples of premature infants from the St. Louis Children’s Hospital, he was shocked to discover that every child had been exposed to antibiotics. As a result, none of the samples could serve as controls. Instead, he compared stool samples from premature infants who had been exposed to antibiotics for just a few days to stool from those exposed for a few months. He found that babies on long-term antibiotics had only a 10th of the bacterial diversity of those exposed for just a few days. In addition, their dominant inhabitants were “bad gut **pathogens***, ” he says. “Our speculation is that because of all the high antibiotic pressure, those are the only bugs that can survive, and they

probably are coming in from surfaces in the NICU.”

Over the past 2 years, Dantas has traced^(L) what happened to those impoverished microbiomes after the babies left the hospital. He showed that at first, the premature infants' microbiomes remained restricted. But by 4 to 6 months of age they had become just as diverse as those of full-term babies. Dantas speculates, though, that the premature infants “may never truly catch up” because they lacked a normal microbial complement at times when they reached key developmental milestones.

That legacy might explain a growing number of suggestive links between early use of antibiotics and disorders such as asthma, **autoimmune disease***, and obesity. For example, in a retrospective analysis of medical records from 64,580 children, those exposed to antibiotics in their first 24 months were at higher risk of early childhood obesity.

Dantas found another disturbing consequence when he examined the microbiomes of 2-year-olds who had been exposed to antibiotics in the NICU: microbes resistant to every antibiotic he tested. Their guts had basically become a breeding ground for antibiotic-resistant microorganisms. “The picture may not be completely grim, but it’s not rosy for sure,” he says. “I understand there’s a risk of infection, but I just haven’t seen compelling data or evidence that showed a clear benefit of those drugs.”

(Marla Broadfoot, 2018, *Science*, slightly modified)

*注：steroids ステロイド製剤(炎症やアレルギーなどの免疫応答を抑える薬の1つ)

diuretic 利尿剤(尿量を増加させる薬の総称)

neonatal 新生児の

mahogany 赤褐色の

blood culture 血液培養

gut microbiome 腸管内微生物相(叢)

synthesizing 合成すること

immune systems 免疫系

asthma ぜんそく

obesity 肥満

Pediatrics 『小児医学』(雑誌名)

necrotizing enterocolitis 壊死性腸炎

neurotransmitters 神経伝達物質

quasi- 準...

stool 便

pathogens 病原体

autoimmune disease 自己免疫疾患

(1) 空欄(A)(D)(H)(J)に最もよくあてはまる英文を下から1つずつ選び、その記号を解答欄に書きなさい。

- (a) Antibiotics are not always the answer!
- (b) What can we do to use these antibiotics more intelligently?
- (c) Wash your hands!
- (d) We're beginning to recognize that the risk of giving those antibiotics may actually outweigh the benefit
- (e) Why did the antibiotics disrupt the immune systems of the selected premature infants?

(2) 下線部(B)について、以下の問いに指定された文字数の日本語で答えなさい。ただし読点も字数に数えます。

- (a) グリーンバーグ医師が関心を持ったのはどのような事実ですか。30字以上45字以下の文字数で答えなさい。
- (b) その事実に基づいてグリーンバーグ医師が抱いているのはどのような懸念ですか。15字以上25字以下の文字数で答えなさい。

(3) 下線部(C)について、次の問いに答えなさい。

(a) challenged に最も近い意味を持つ語句を下から選び、その番号を解答欄に書きなさい。

- ① disputed
- ② invited to a fight
- ③ ordered
- ④ taken on a trial
- ⑤ inspired
- ⑥ thrown down

(b) that practice の内容を明確にして、下線部(C)を日本語に訳しなさい。

(c) the best way to protect a hospital's most vulnerable patients であることを支持する新生児の現状が、下線部(C)以下の本文に書かれています。これについて次の問いに答えなさい。

- ① 最も適切な英文を探し出し、文頭と文尾の英単語3語をそれぞれ解答欄に書きなさい。
- ② 上記①で探し出した英文を日本語に訳しなさい。

(4) 下線部(E)を正しい順序に並び替え、解答欄に書きなさい。

(5) 下線部(F)と(G)の語に最もよく当てはまる意味を下から選び、その記号を解答欄に書きなさい。ただし、下の選択肢は(F)、(G)のどちらかに1回しか使えません。

- (a) an invitation
- (b) a living cell
- (c) arranged in layers
- (d) heavily dressed
- (e) a large number
- (f) thorough

(6) 下線部(I)について、その内容を65字以上85字以下の日本語で説明しなさい。ただし句読点も字数に数えます。

(7) 下線部(K)について、その内容をまとめた下の(a)~(e)の空欄を、指定された文字数の日本語で埋めなさい。ただし、読点も字数に数えます。

- ・未熟児で生まれた新生児の便のサンプルを、セント・ルイス小児病院から取り寄せた。
- ・そのサンプルから、どの新生児も(a)(10字以上15字以下)ことがわかった。
- ・その結果、どの新生児の便も(b)(10字以上20字以下)。
- ・そこで、(c)(25字以上40字以下)。
- ・その結果、(d)(40字以上50字以下)ことがわかった。
- ・さらに、(e)(20字以上35字以下)ことも判明した。

(8) 下線部(L)の結果について説明している適切な英文を下から全て選び、解答欄に記号を書きなさい。

- (a) There seemed to be a strong link between early use of antibiotics and diseases commonly found among premature babies.
- (b) It was found that premature infants' microbiomes became as diverse as those of full-term infants by six months old.
- (c) The bad pathogens in premature babies came from the air in the intensive care unit.
- (d) For a short time after discharge, there were less diverse microbiomes in premature infants' guts.
- (e) A study showed that taking antibiotics after premature infants left the hospital had some influence on them.
- (f) Early use of antibiotics surely prevented infections that premature infants' immune systems couldn't fight on their own.
- (g) Premature infants' microbiomes had not grown into the expected diversity when they reached crucial periods of development.
- (h) It was commonly found that the gut microbiome in premature infants weighed about as much as the liver.

2 The following article entitled “In praise of slow” describes the lessons a young female researcher learned from her experience of getting a **Ph.D.*** and then a permanent job at a university. She also likes running and often participates in marathons. She compares running in a marathon with the “race” of life, and explains how she can apply the lessons from her running experience to her life as a researcher. Read the article and write an English essay following the directions below.

Directions

- (a) Choose one lesson from among (A) through (D) which interests you most, and write an essay of about 200 to 250 words, responding to the following questions: 1) Do you agree or disagree with the lesson?; 2) Why or why not? Write about your ideas, referring to your own experiences. If you quote a phrase or sentence from the text, put it in single quotation marks (‘. . .’).
- (b) In the spaces provided on the answer sheet, write “A”, “B”, “C”, or “D” (the lesson you have chosen) in the parentheses at the beginning, and your total essay word count at the end.

In praise of slow

I **huff and puff*** my way up the moderate slope. Even by my own **abysmal*** standards, this is a poor run. In the past hour, I have been overtaken by both an **octogenarian*** and a mother pushing her toddlers in a buggy. Yet I am smiling. I am a happy runner, despite my utter **mediocrity*** at this sport. But at work, happiness had become **elusive***. After a relatively relaxed Ph.D. and **postdoc***, I had been thrilled when I landed a **tenured*** job. But as I worked to establish myself as a group leader, I began to feel intense pressure to be more competitive and publish more. Recently, as I wondered why I felt so **discontented*** at my job, I realized that I could apply some lessons from running to my research.

- (A) Lesson one: ***In the right race, your weakness can become your strength.*** For more than 30 years I equated running to speed and so, lacking the muscles of a sprinter, I chose not to run at all. But once I finally started running, I learned that not being able to sprint makes me a better endurance runner. Similarly, I often perceived my inability to focus on a single research topic as a barrier to success as an academic scientist. But I’ve found that my desire to **branch out*** to different fields helps me make connections across disciplines and see my work in new ways, which has led to unexpected and exciting insights.

- (B) Lesson two: *Choose the right pace for your race.* Last Christmas, a silver-haired gentleman helped me beat my **lamentable*** 5 km personal best by whispering, “Go at your pace, not theirs!” when I got stuck behind slower runners. I now realize that this would have been excellent advice early in my career. Some Ph.D. students push themselves too hard and burn out, but I had the opposite problem. I was happy to **trundle*** along at the slowest pace I could get away with — but it ultimately held me back. Even though I like my slow-but-steady pace, I still needed to learn to push myself rather than **drag my feet***.
- (C) Lesson three: *An honest race is the only race worth running.* I invariably finish in **the bottom quartile*** of the local 5 km run. All I would have to do to move up a couple of hundred places is take a shortcut through the fields. Yet I don’t. Nobody does. Scientists are usually like that, too — but not always. Laboratory leaders are pressured to keep their spot in the fast lane, postdocs are chasing the elusive permanent contract, and students are keen to make their mark. Several of my publications would have had a much easier ride through the reviewing system had I been slightly less honest about our findings. The temptation to cheat to get an advantage can be great. However, and this is something that is often overlooked, an advantage is only useful if you are, in fact, engaged in a competition. This brings me to the last lesson, which is the most important of all.
- (D) Lesson four: *There really is no race.* For me, running isn’t about being faster than other runners. Likewise, my goal in research is not to “beat” my colleagues. Mark Rowlands, a philosopher, academic, and runner, argues that running makes us happy because it is a form of play and as such has intrinsic value. I don’t run just to eat more peanut butter or to save money on psychotherapy (although these are strong motivating factors in my case). I run because doing so offers a glimpse of life’s real value. I now think this is the secret to being happy in research, too. I don’t do research only to get invited to conferences, see my name in print, or be promoted. Like running, research is a game with its own intrinsic value. Playing this game of discovery gives me enough joy to keep me going.

Do I recommend an academic career in the slow lane? It doesn’t work for everybody. Letting go of ambition in academia is a bit like leaving your GPS watch at home when heading out for a run. Scientists are ambitious; they want to be the hares leading the race ahead. But the tortoise’s secret is that there is a lot of fun to be had at the back of the pack.

(Irene Nobeli, 2018, *Science*, slightly modified)

*注 Ph.D.: Doctor of Philosophy; the highest possible degree involving advanced research
huff and puff: to breathe out in a noisy way
abysmal: extremely bad
octogenarian: a person who is in his/her eighties
mediocrity: the quality of being average or not very good
elusive: difficult to find, catch, or achieve
postdoc: relating to study done after a Ph.D.
tenured: having a permanent academic post
discontented: dissatisfied
branch out: to do something a little different from what you normally do
lamentable: unfortunate and regrettable
trundle: move heavily and slowly
drag one's feet: walk or act slowly and reluctantly
the bottom quartile: the worst quarter of a group