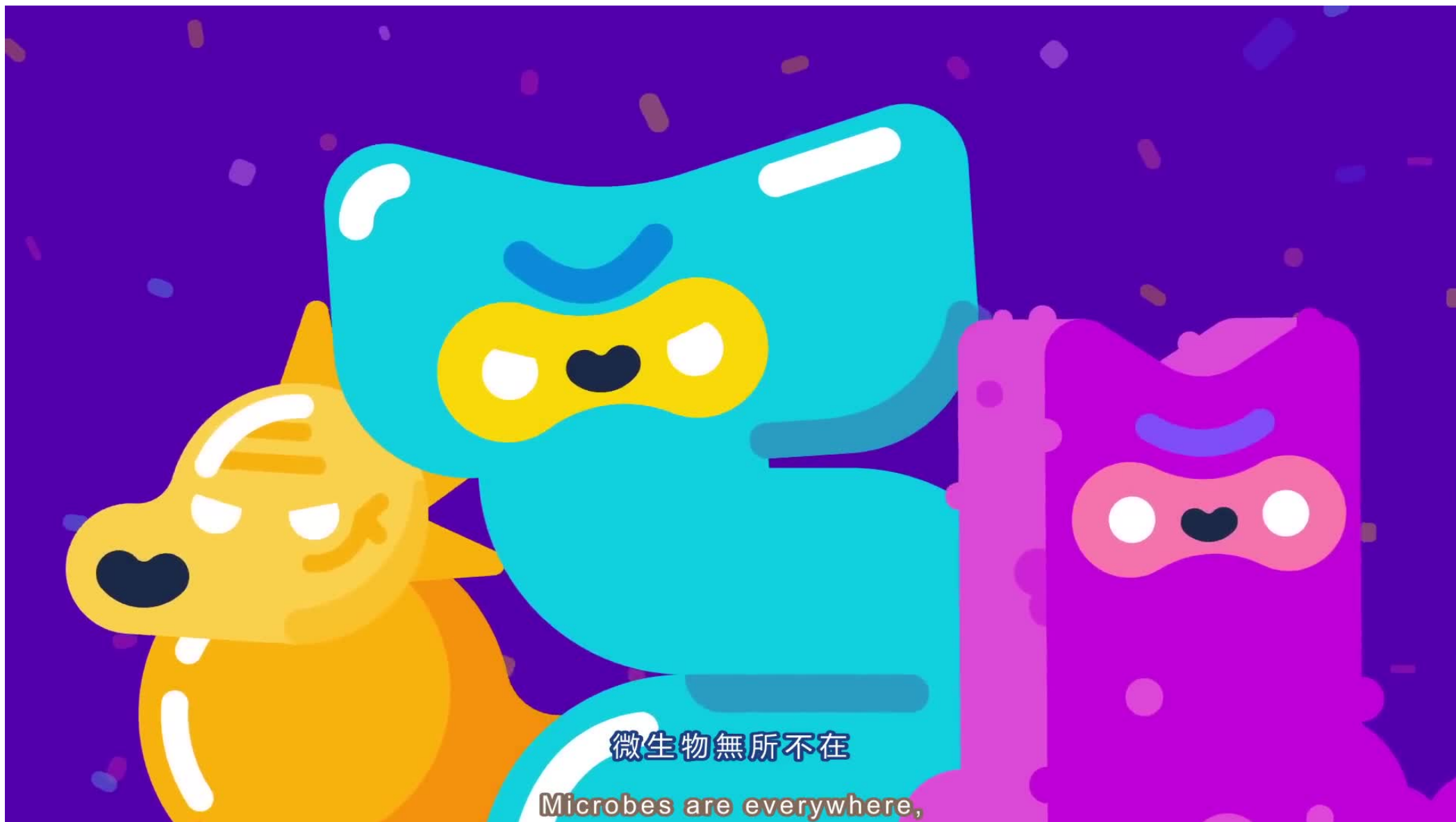




微生物無所不在

Microbes are everywhere,



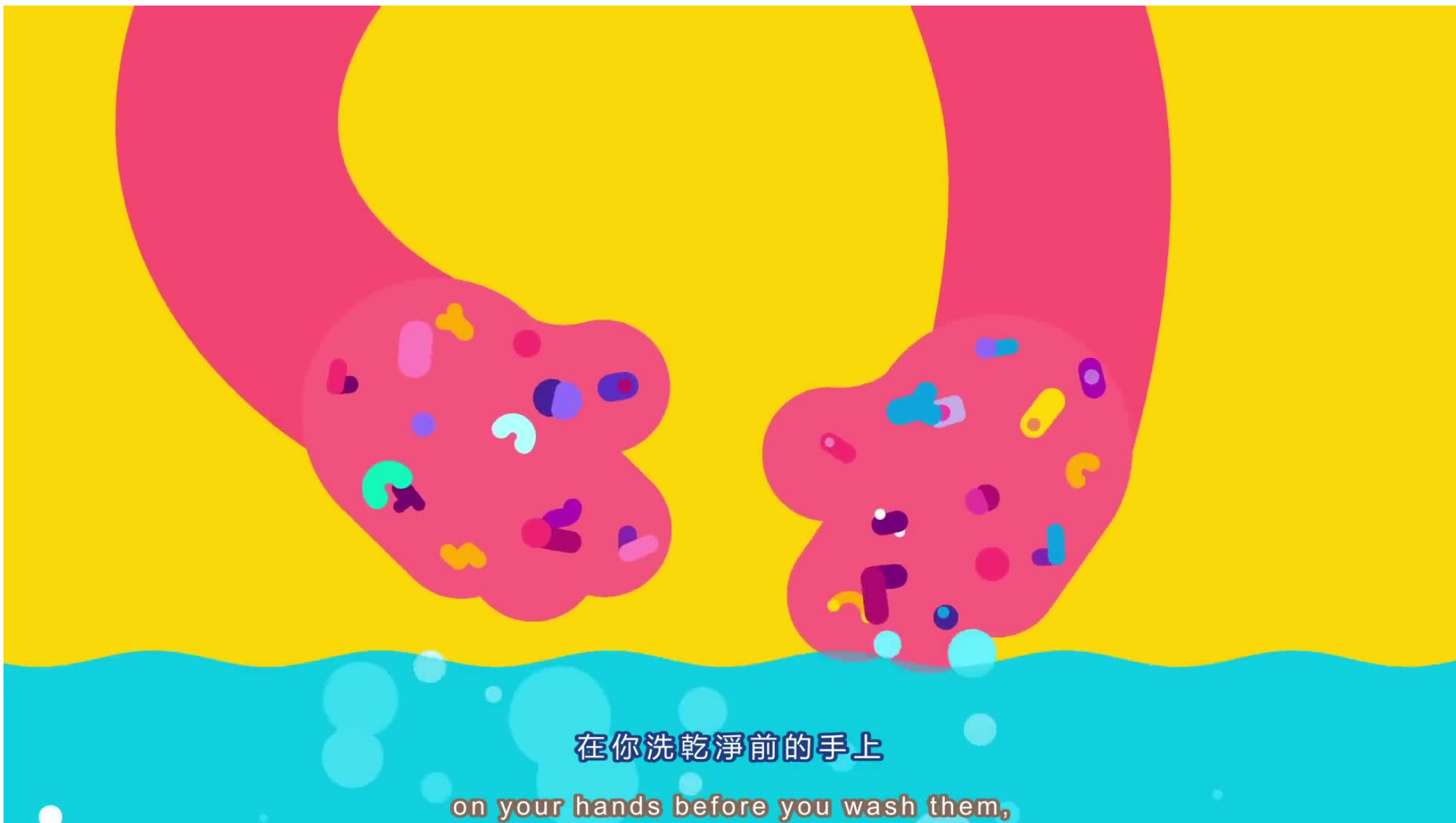
在你的手機上

on your phone,



在你的水瓶裡

in your water bottle,



在你洗乾淨前的手上

on your hands before you wash them,



以及洗乾淨後的手上

on your hands after you wash them,



還有在你全身各處，絕不誇張

and literally everywhere else on top of you too.

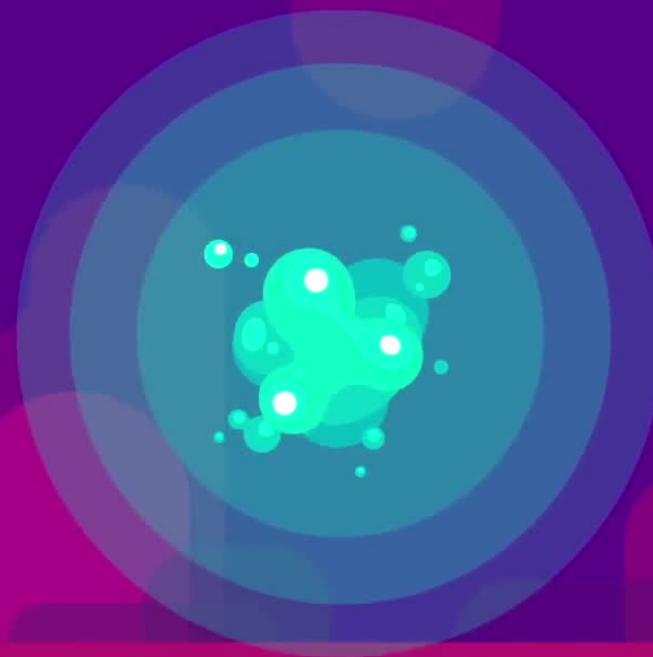
An abstract graphic with a vibrant magenta background. In the center is a large, stylized heart shape. The heart is composed of two overlapping circles: a darker purple one on top and a lighter pink one on the bottom. Scattered throughout the entire image are various colorful, stylized shapes representing microbes or cells. These include circles, ovals, and irregular shapes in shades of purple, blue, yellow, pink, and cyan. Some of these shapes have smaller circles inside them, giving them a cellular appearance. The overall style is modern and illustrative.

微生物無時無刻無所不在，而我們對此卻束手無策
Microbes are omnipresent at any moment,
and there is nothing we can do about it



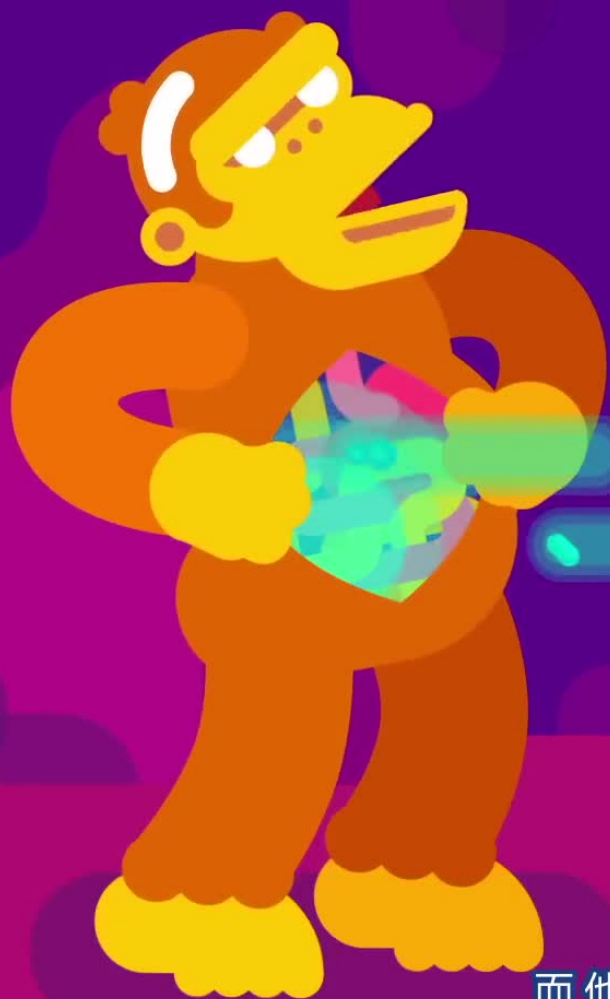
因此幾百萬年來，人類和他們就簽訂了契約

So, millions of years ago we made a pact,



我們提供庇護和食物

we give them shelter and food,



而他們反過來為我們工作
and in turn they work for us.



但是我們對這段夥伴關係瞭解的越多，
就越加發現這就像是場冷戰
But the more we learn about this partnership,
the more it looks like a cold war



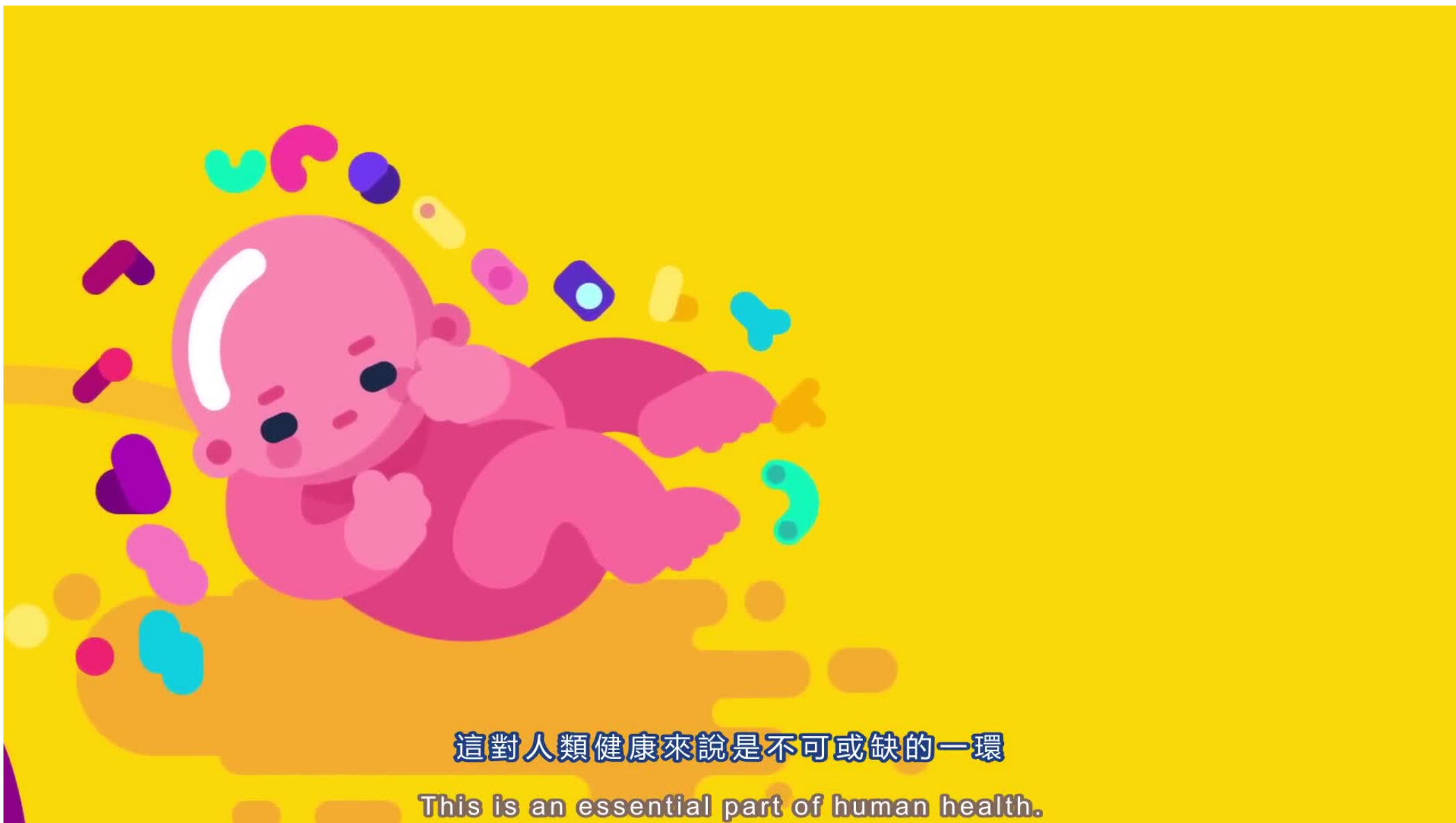
人類胎兒在母親子宮裡，是完全無菌的
Inside our mother's womb,
humans start out sterile



在經過產道出生時
When we are born and traveling
through the birth canal,



無數母親身上的細菌就鋪蓋在新生兒的身上
billions of our mother's bacteria cover
every single part of our bodies.

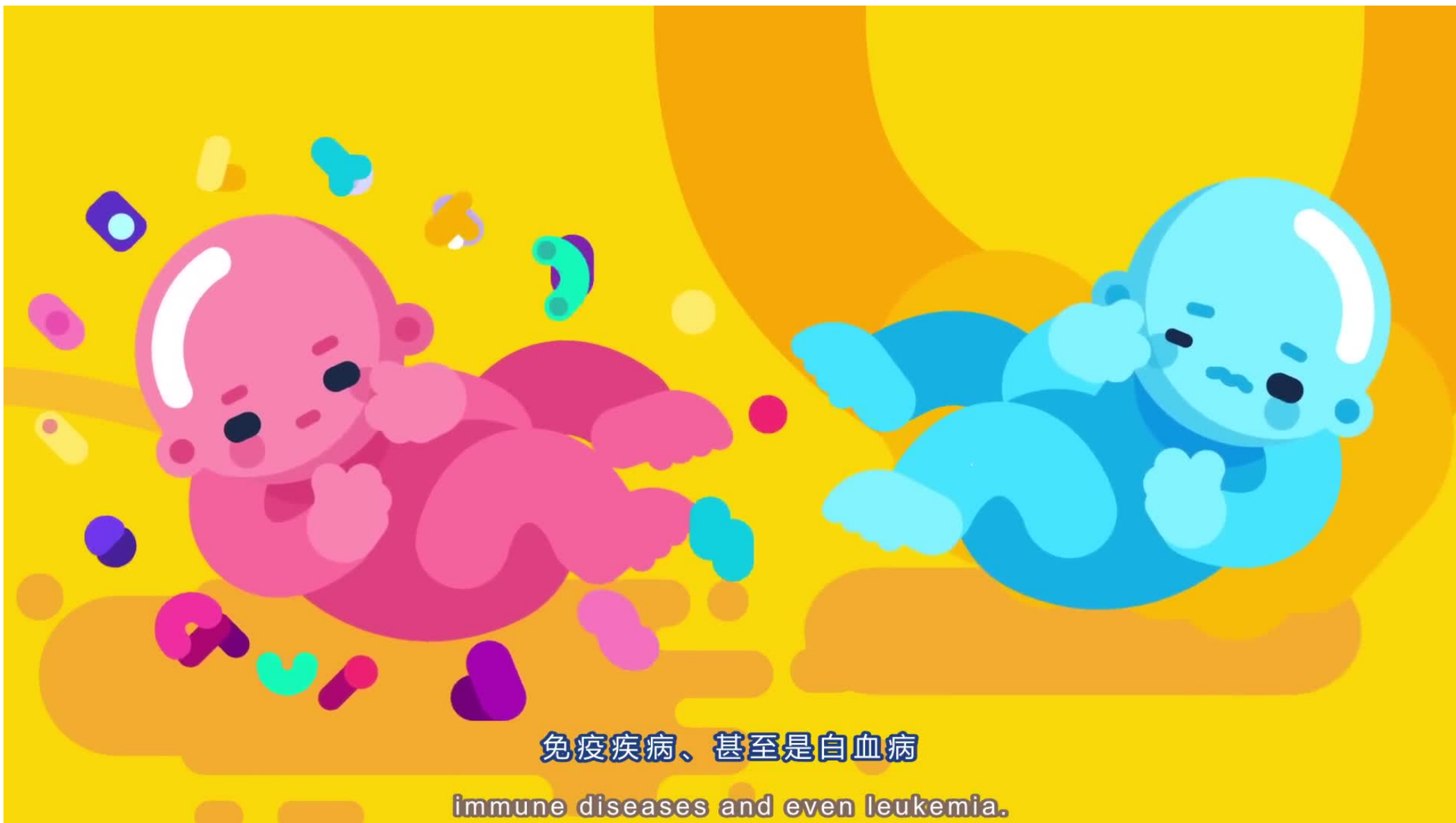


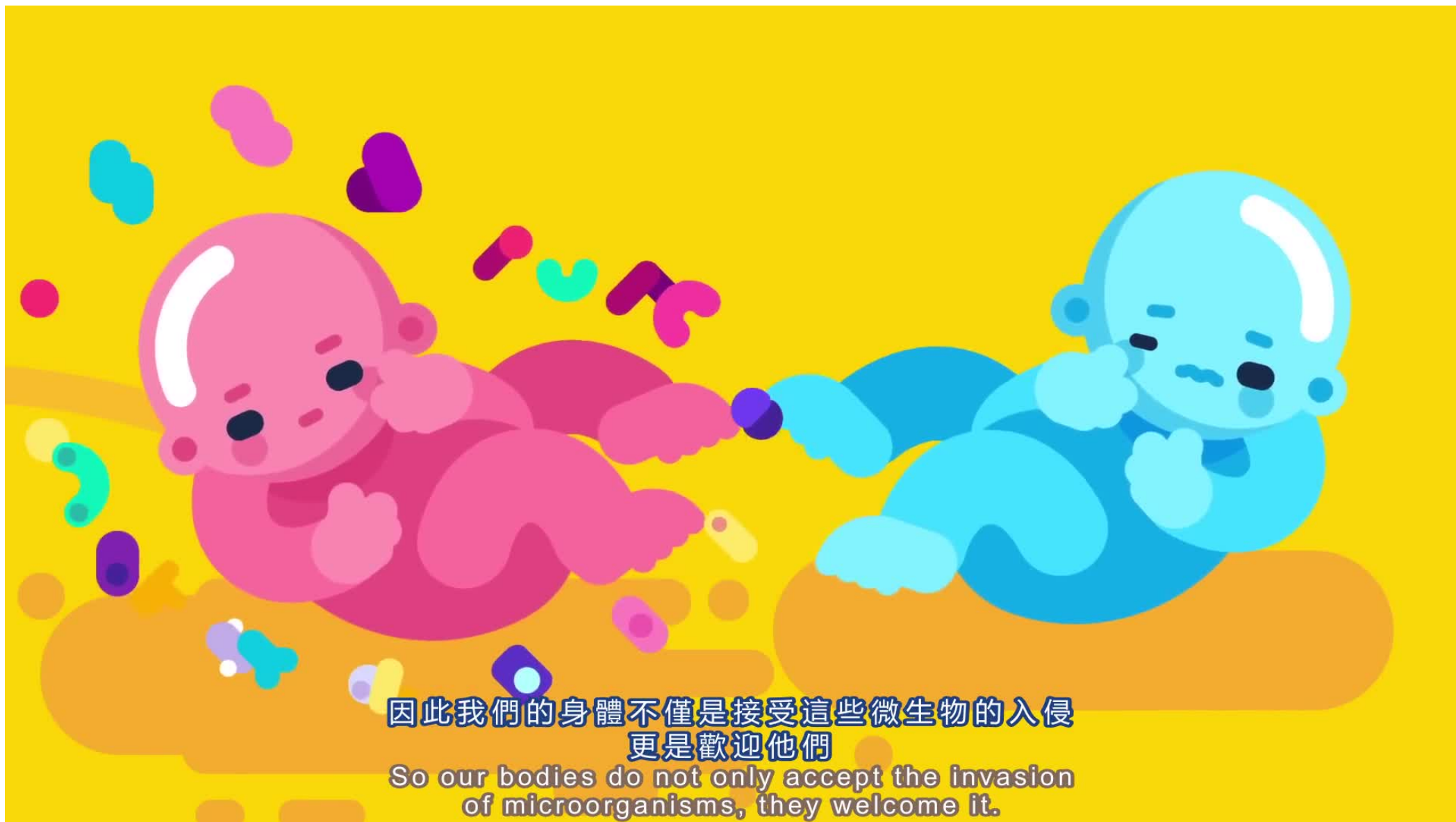
這對人類健康來說是不可或缺的一環

This is an essential part of human health.



剖腹產出生的新生兒，有較高的機率得到氣喘。
Children born via C-section have a
higher rate of asthma,



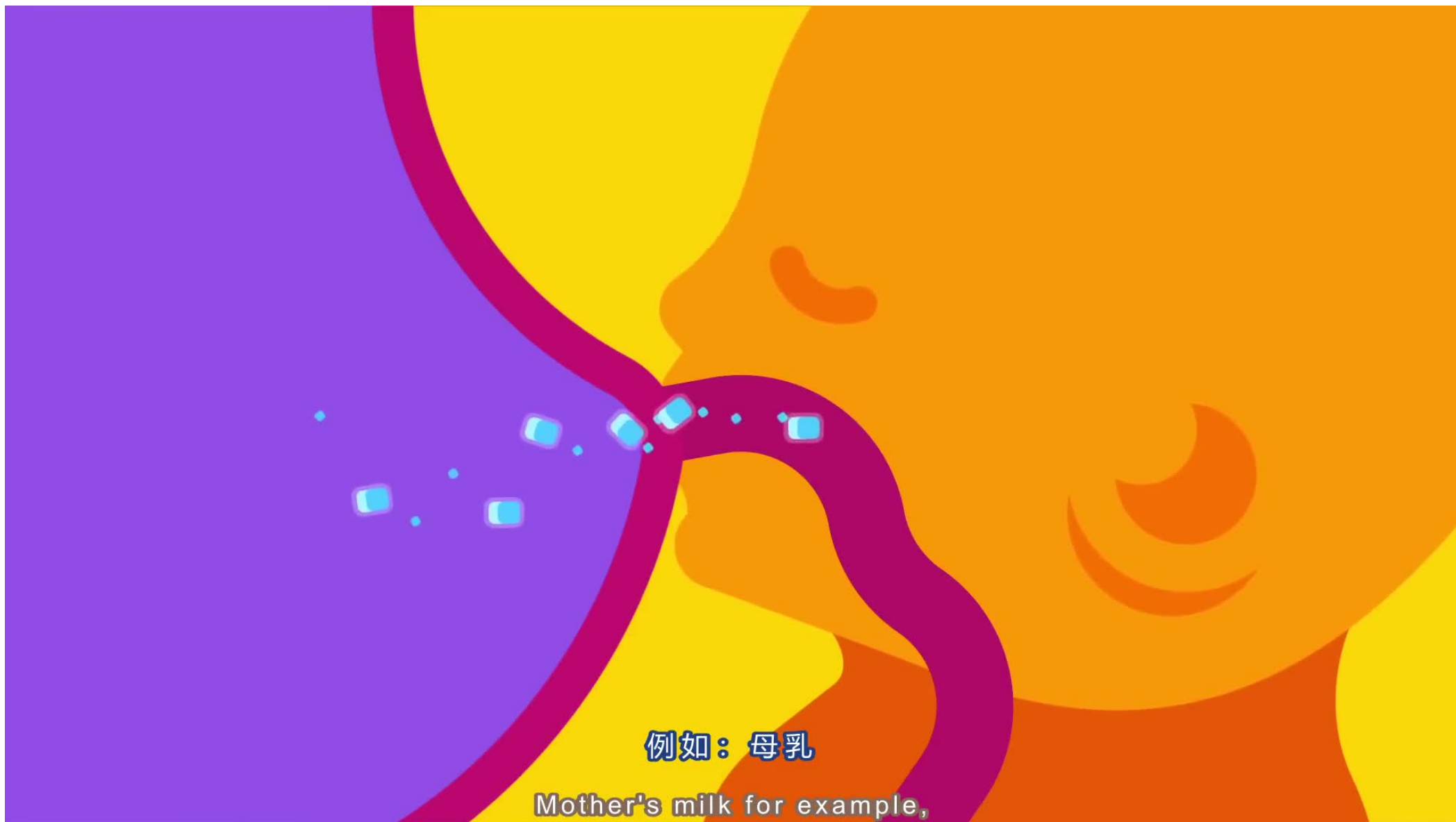


因此我們的身體不僅是接受這些微生物的入侵
更是歡迎他們

So our bodies do not only accept the invasion
of microorganisms, they welcome it.

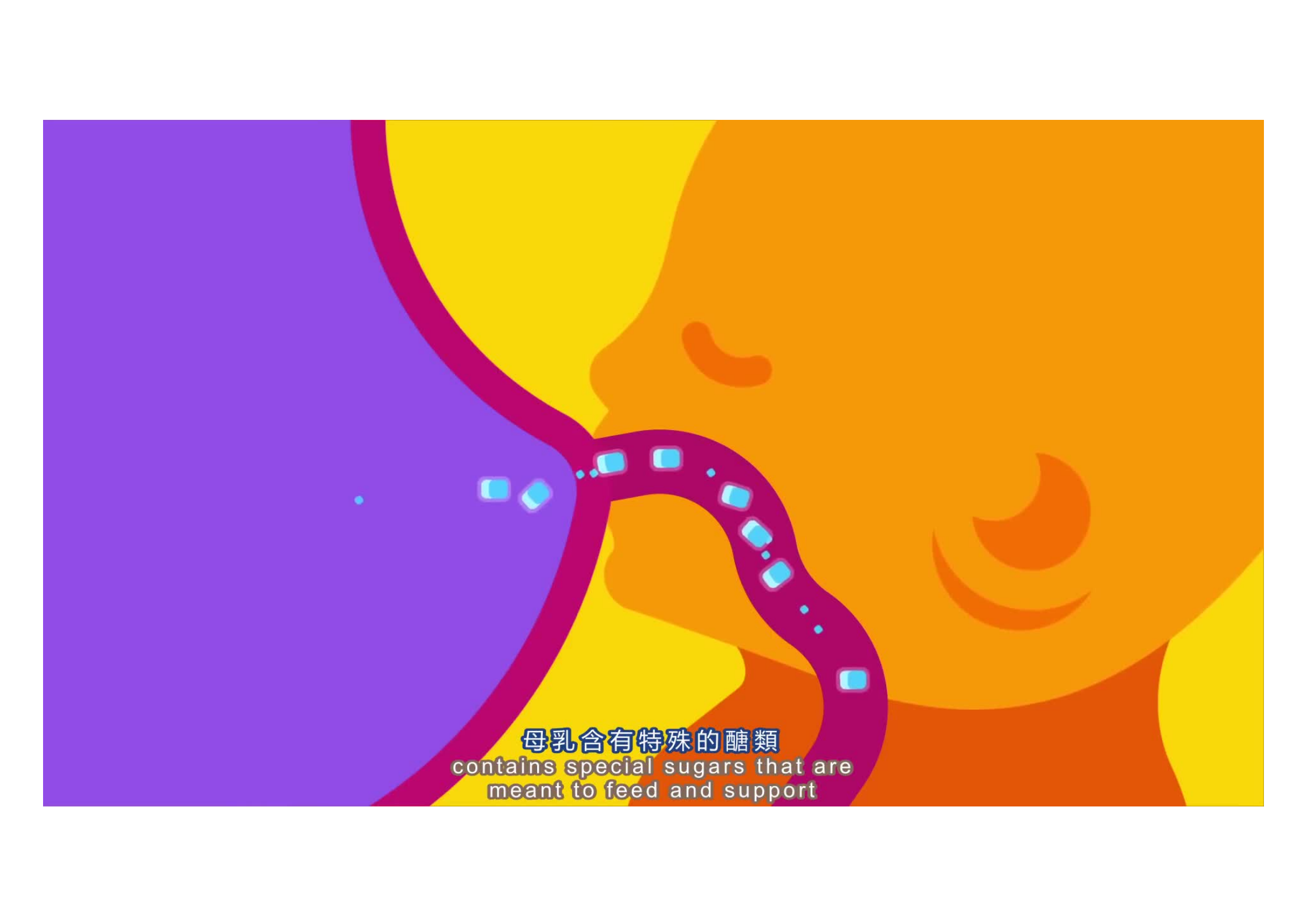
The background is a vibrant, abstract composition of organic shapes in various shades of orange and yellow. A stylized profile of a human face is subtly integrated into the design, with the eye area represented by a dark orange crescent and the mouth by a lighter orange, curved shape. The overall effect is warm and intimate.

幾百萬年來，我們共同演化出對彼此最佳的關係
Over millions of years, we co-evolved to
make the best of our relationship.

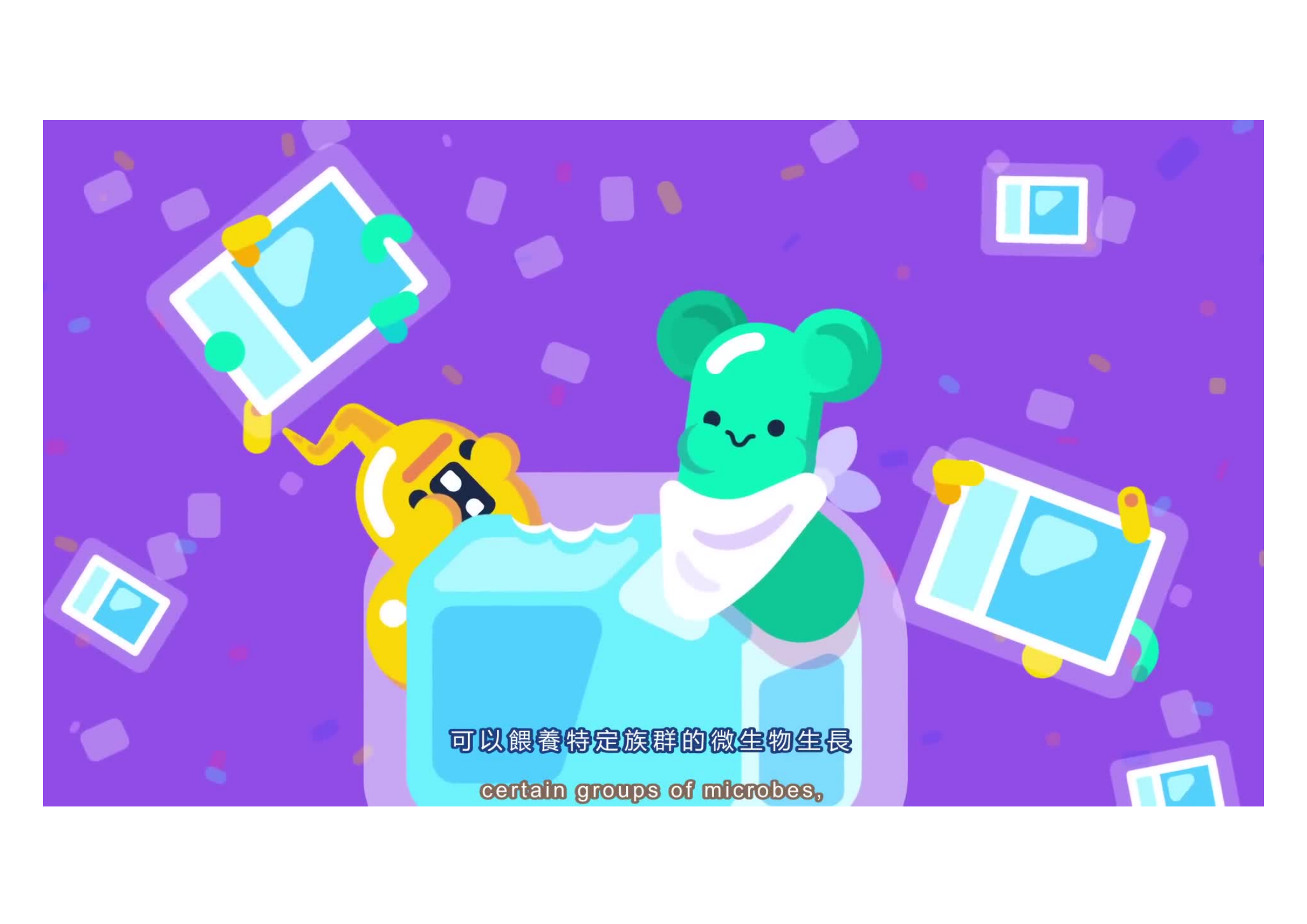


例如：母乳

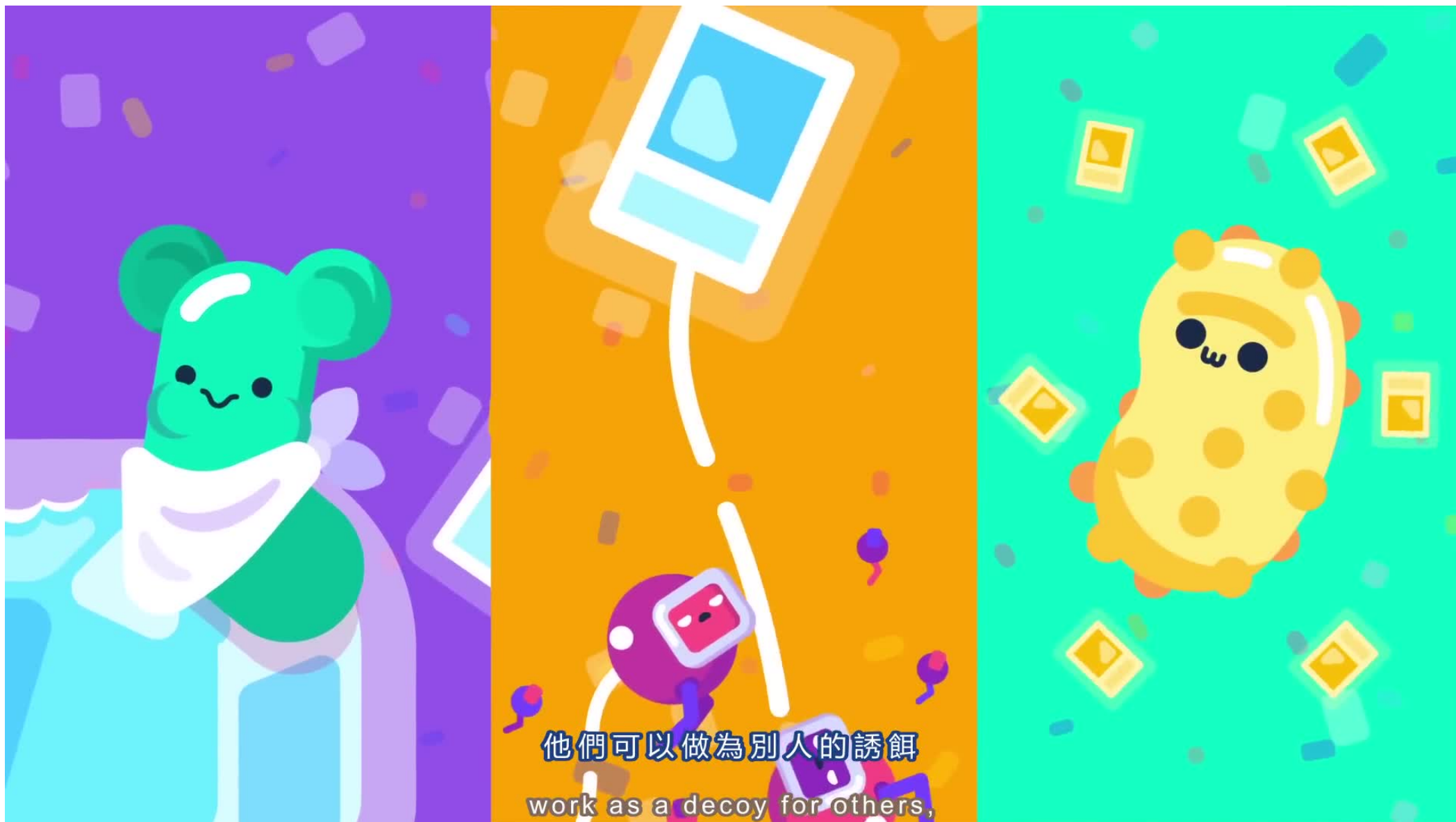
Mother's milk for example,

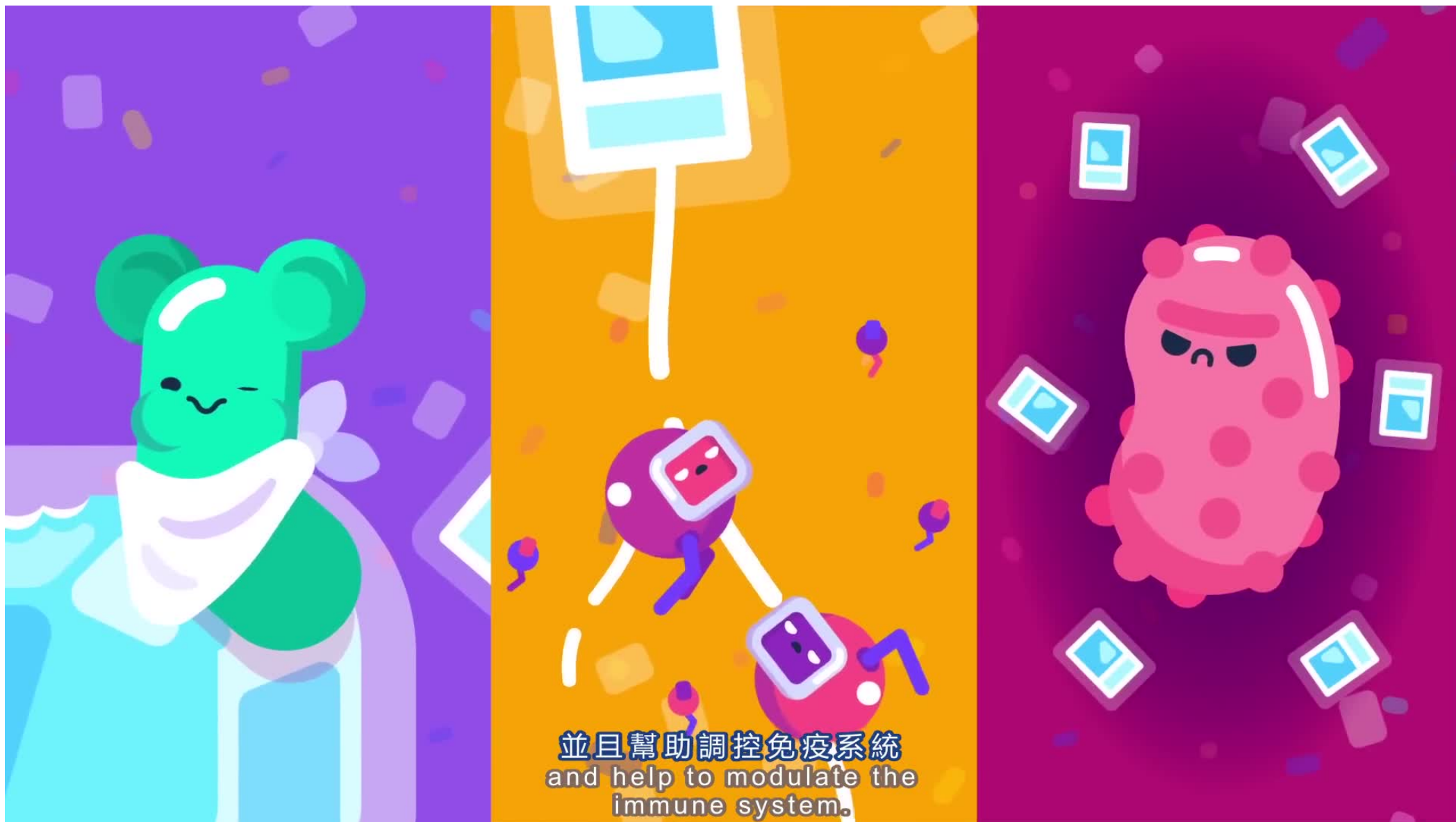
A stylized illustration of a mother breastfeeding her baby. The mother's face is shown in profile on the right, with a warm orange and yellow color palette. The baby is on the left, with a purple and blue color palette. The baby's mouth is open, and a thick, dark purple line representing the breast is shown entering the mouth. Along this line, there are several small, light blue, rounded rectangular shapes, representing special sugars. The background is a solid light blue.

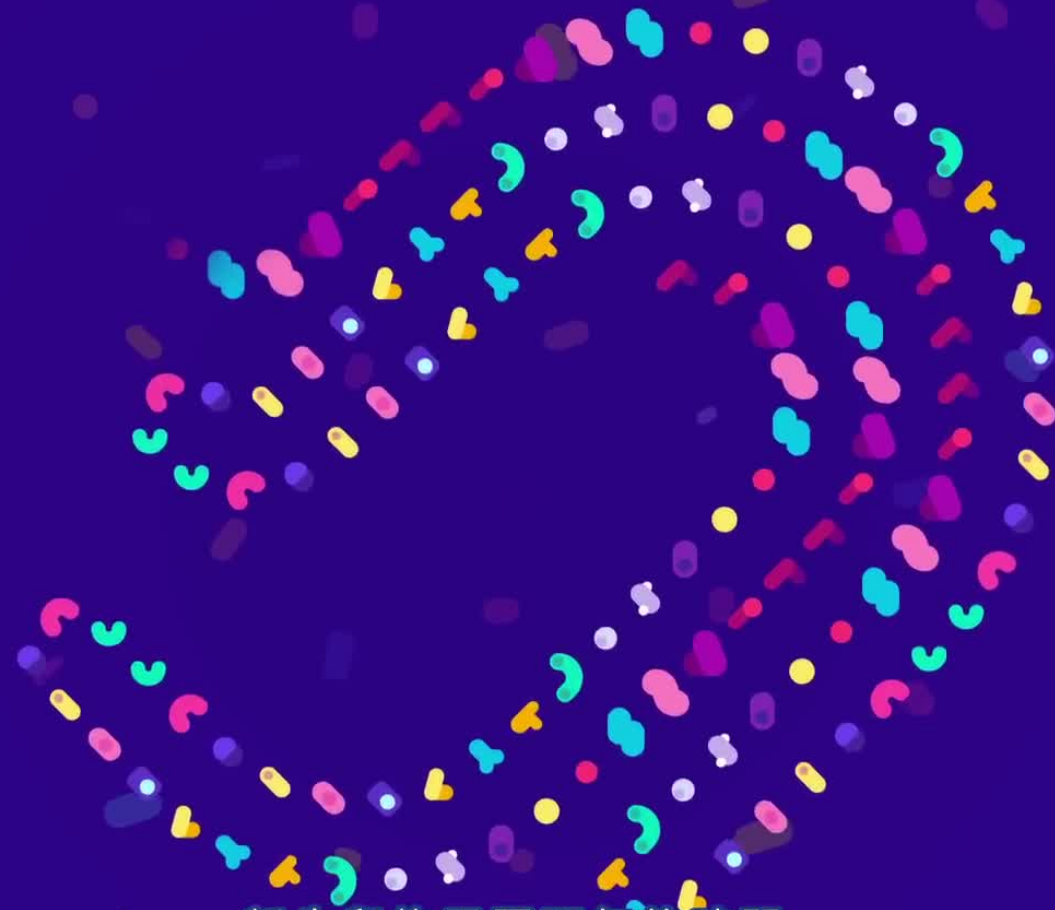
母乳含有特殊的醣類
contains special sugars that are
meant to feed and support



可以餵養特定族群的微生物生長
certain groups of microbes,







新生兒約需要兩年的時間
才能形成完整健康的菌叢
It takes up to two years, until a healthy
microbe community has formed.



每個人都有他獨特的微生物群系
包含有細菌、

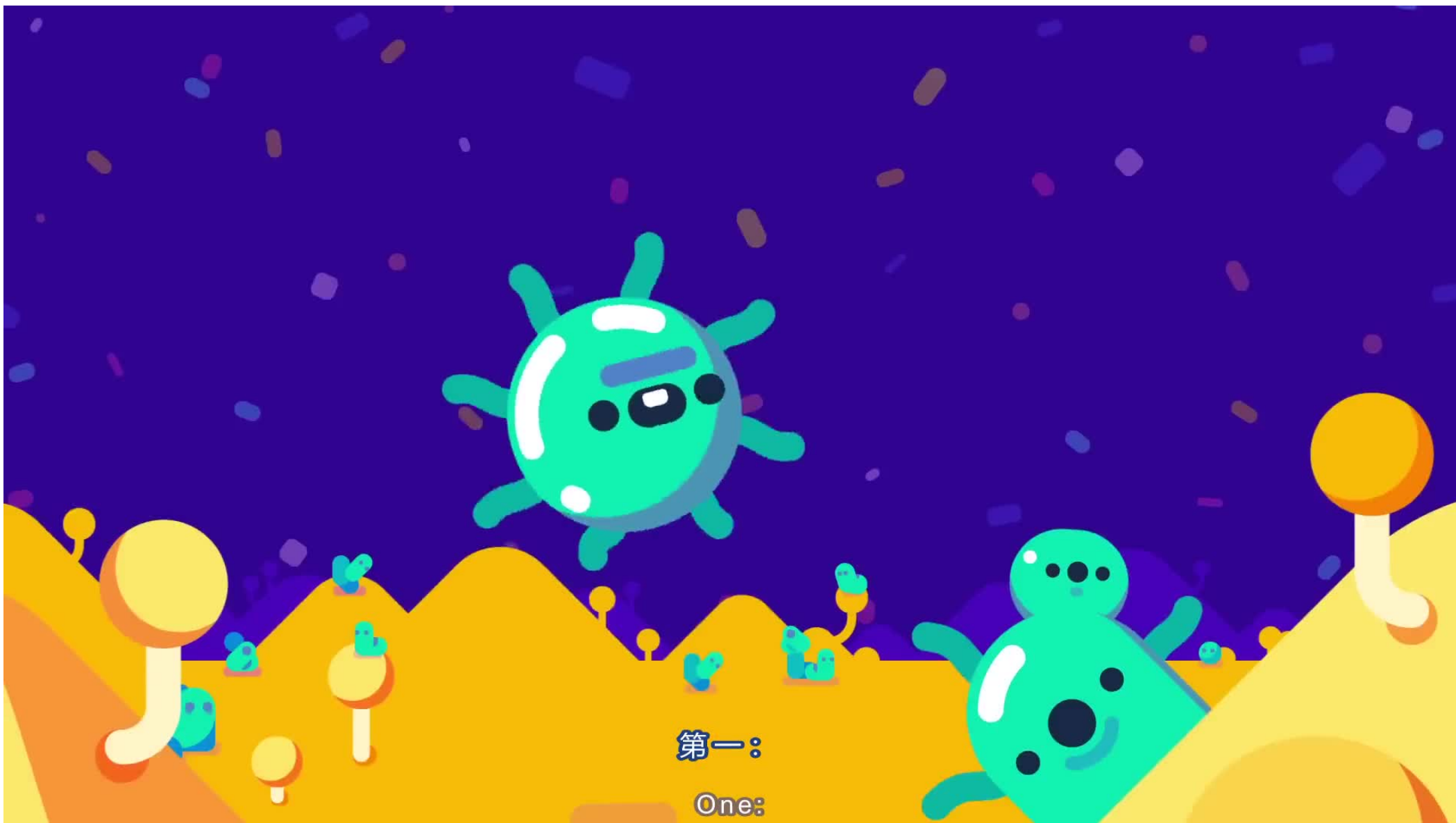
Every human has their own unique microbiome,
made up of bacteria,



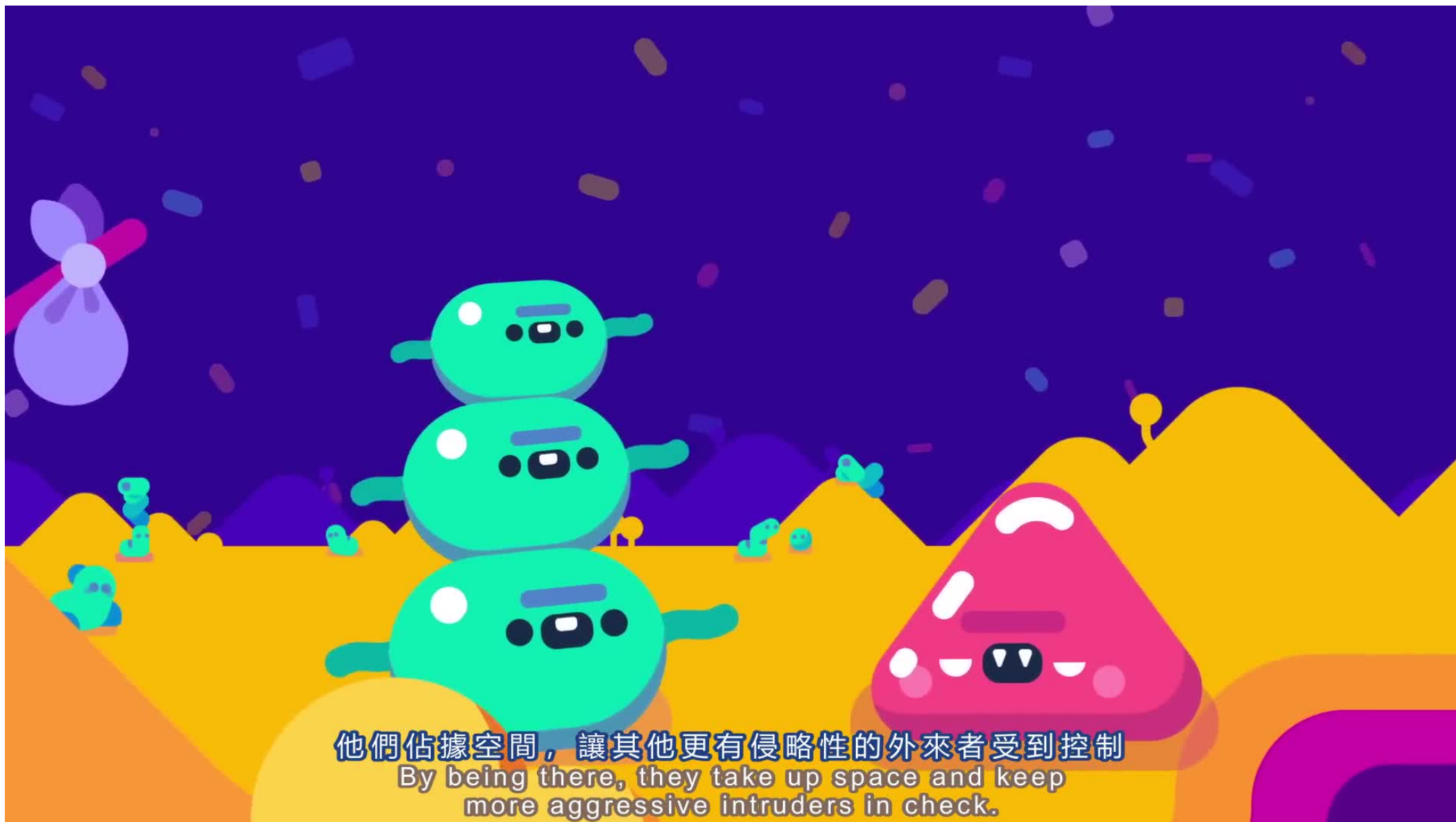
病毒、真菌以及其他微生物
viruses, fungi and other organisms.



在我們身上及體內有三種類型的賓客
We have three categories of guests,
on and in our bodies.







他們佔據空間，讓其他更有侵略性的外來者受到控制
By being there, they take up space and keep
more aggressive intruders in check.



第二:

Two:



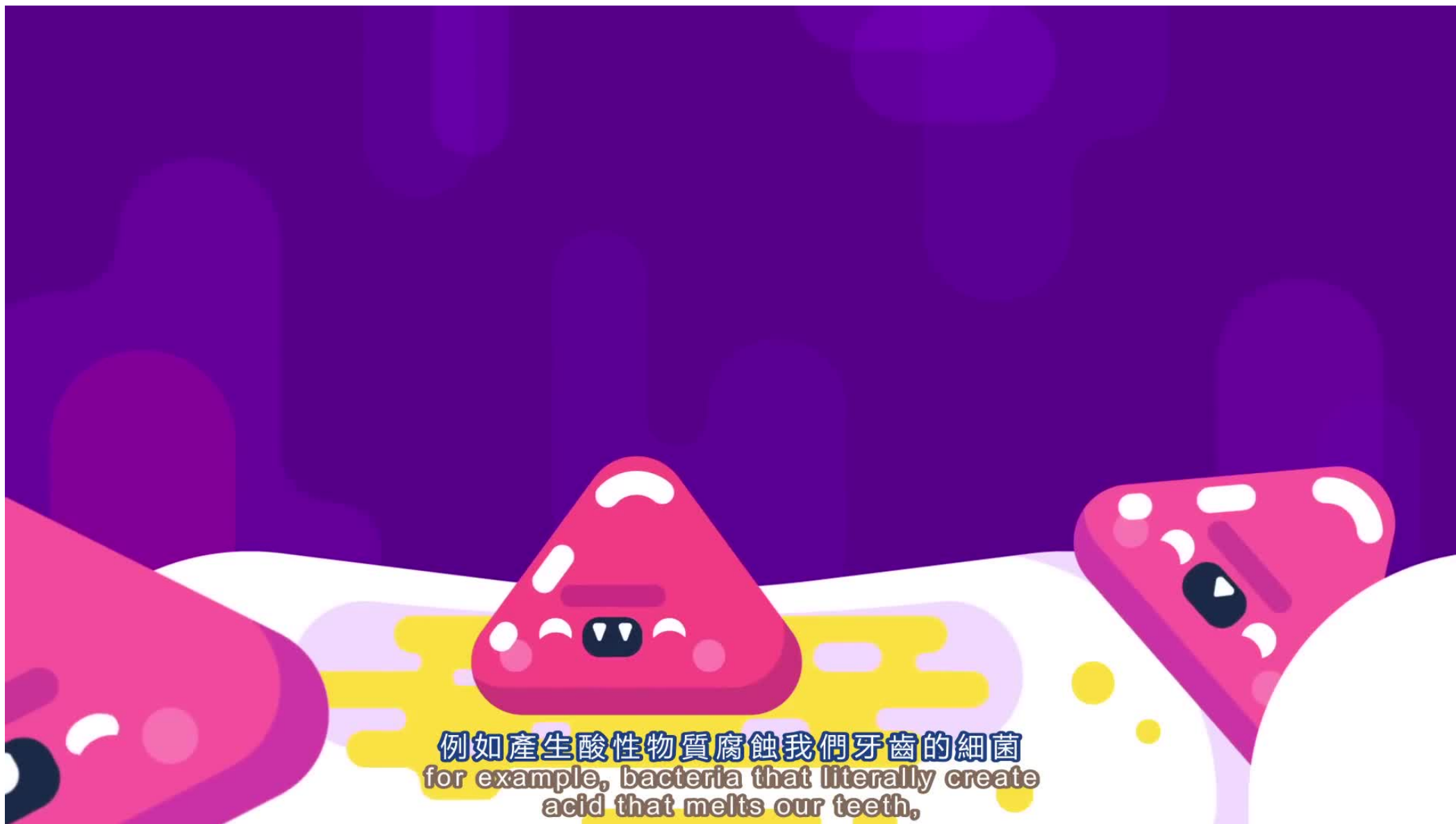
那些會傷害我們的客人們

Guests that harm us,

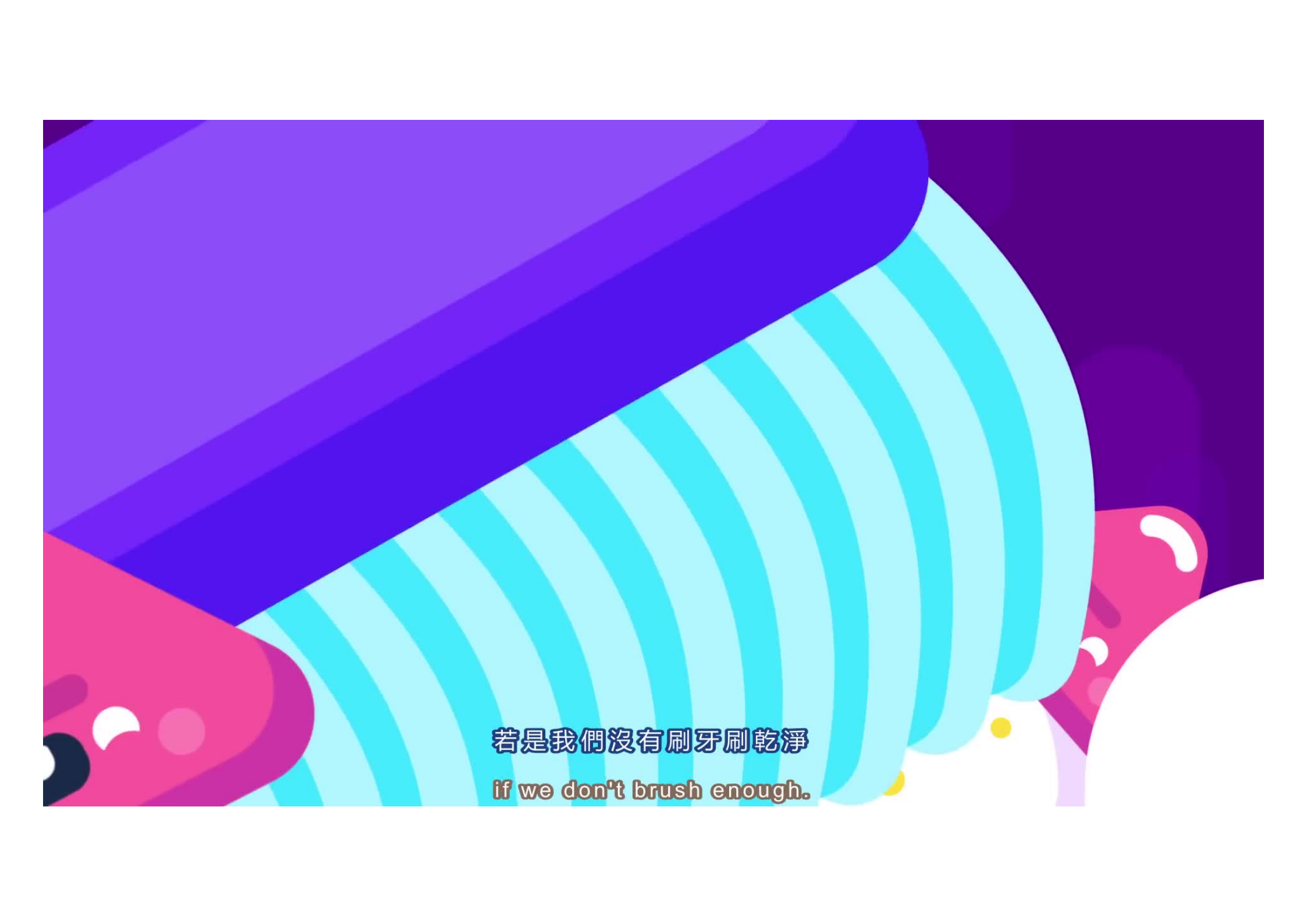


但透過他們使我們學習生存

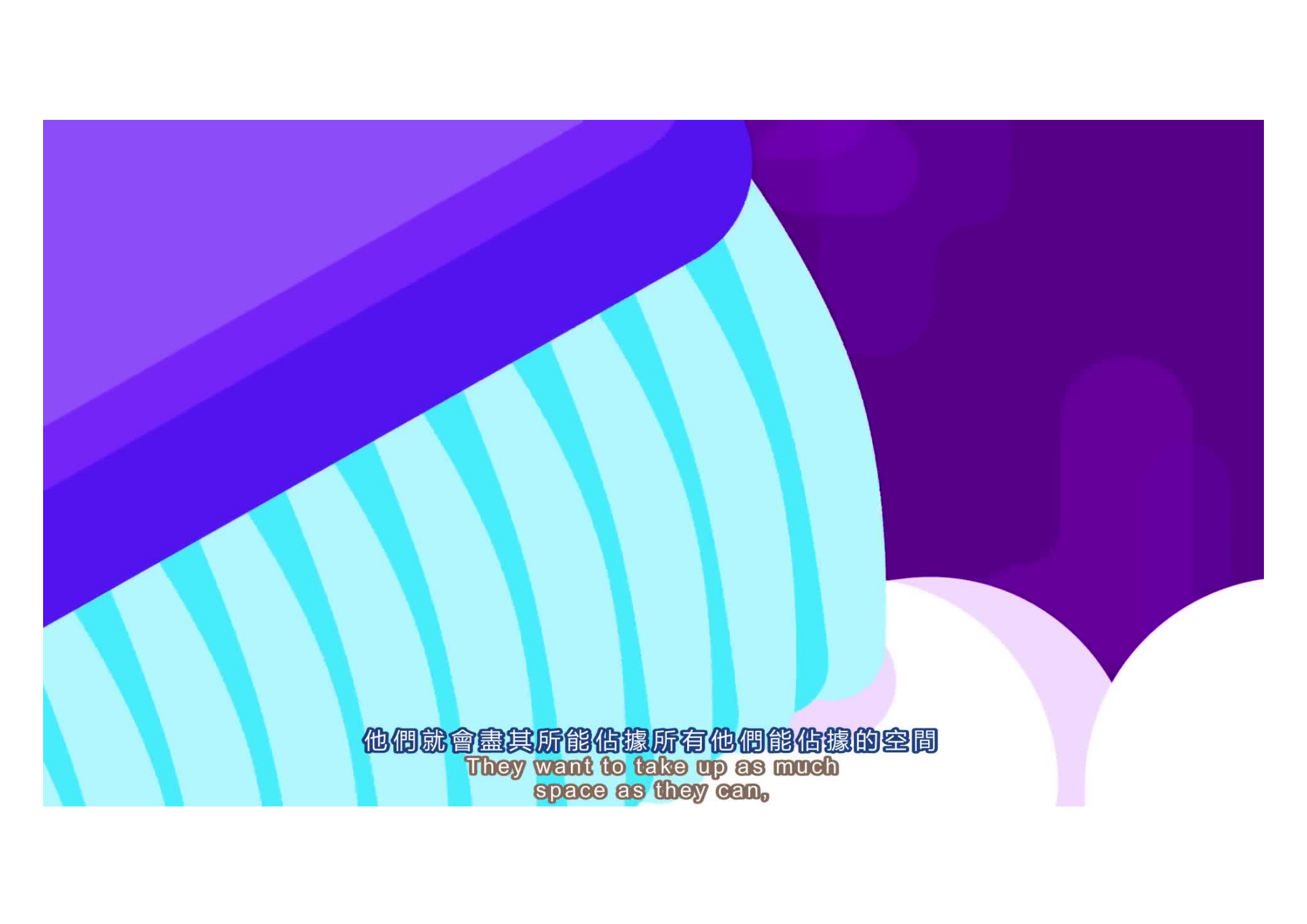
But with whom we've learned to live,



例如產生酸性物質腐蝕我們牙齒的細菌
for example, bacteria that literally create
acid that melts our teeth,



若是我們沒有刷牙刷乾淨
if we don't brush enough.



他們就會盡其所能佔據所有他們能佔據的空間
They want to take up as much
space as they can,

The background is a solid dark purple. Overlaid on this are several large, soft-edged, organic shapes in a lighter shade of purple and white. These shapes are layered, creating a sense of depth. In the bottom right corner, there is a small, dark purple rectangular element with some white circular patterns, possibly a logo or a decorative detail.

而我們並不想讓他們為所欲為

and we don't want them to.



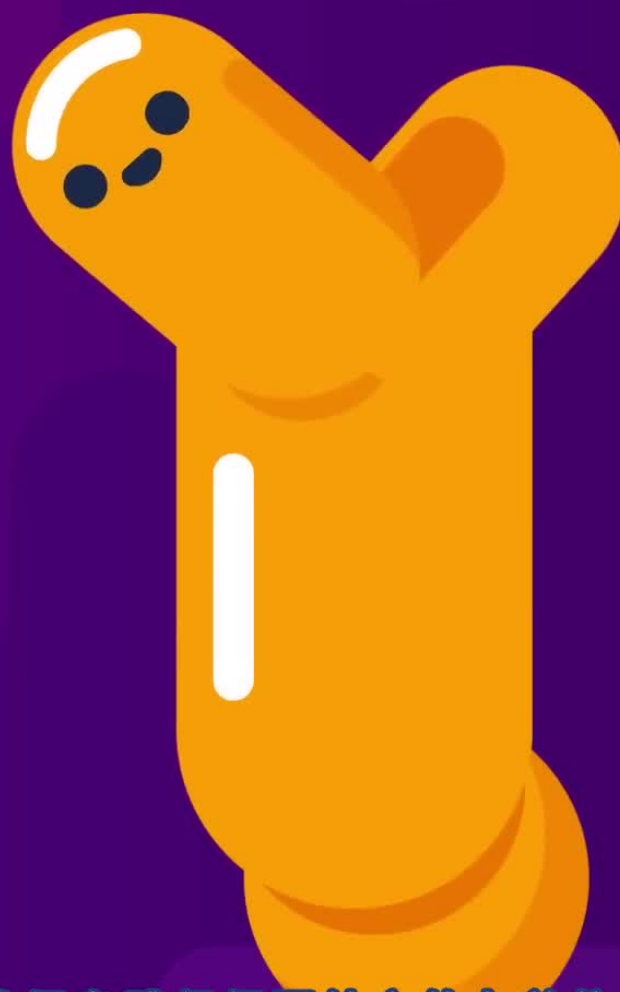
但卻無法完全擺脫他

But, we can't get rid of them entirely.



第三:

Three:



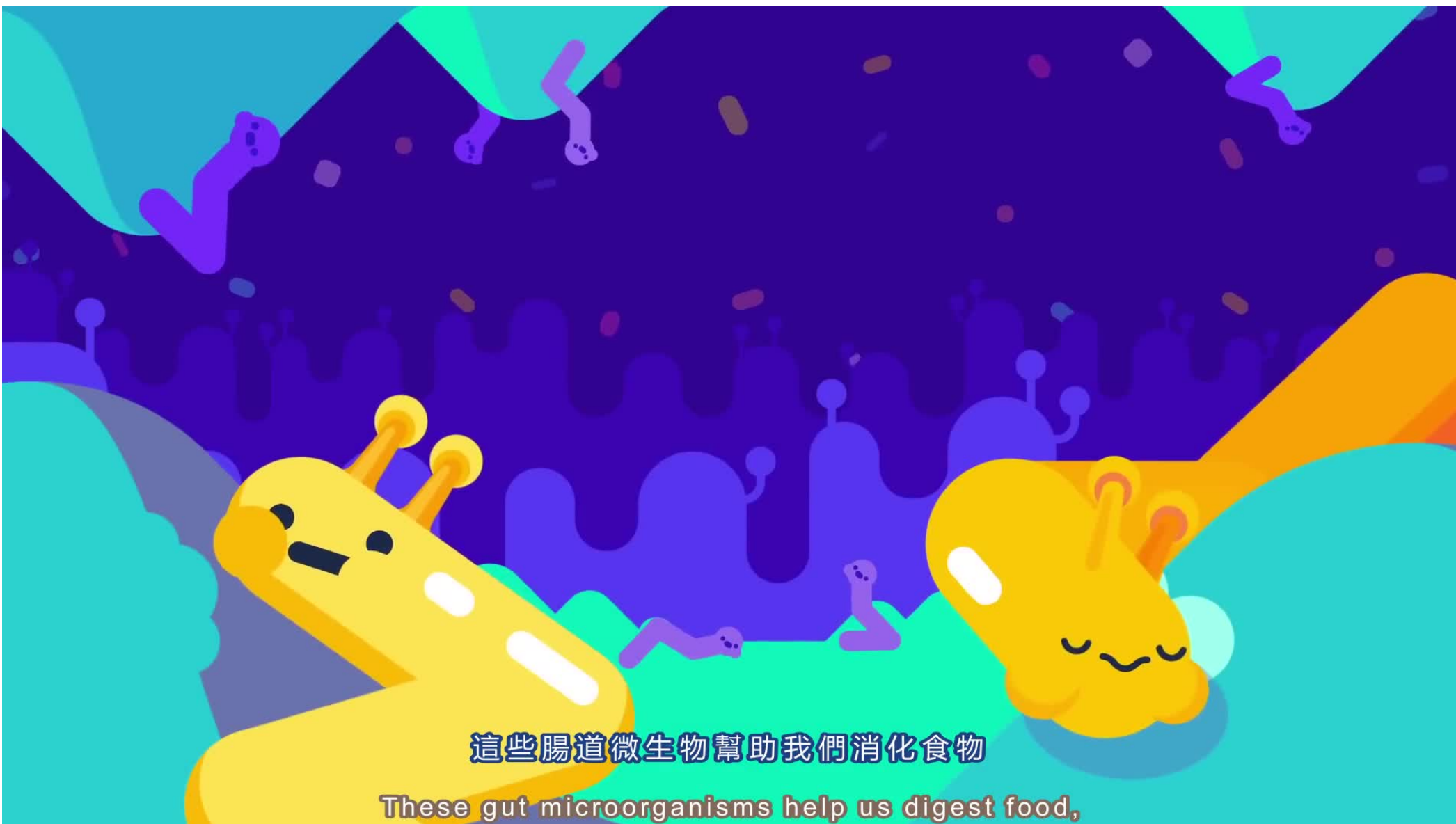
我們身體很想要結交的友善傢伙
Friendly fellows that our bodies
want to have around,



他們大多是380兆個細菌族群
most of them are a community of
380,000 billion bacteria,

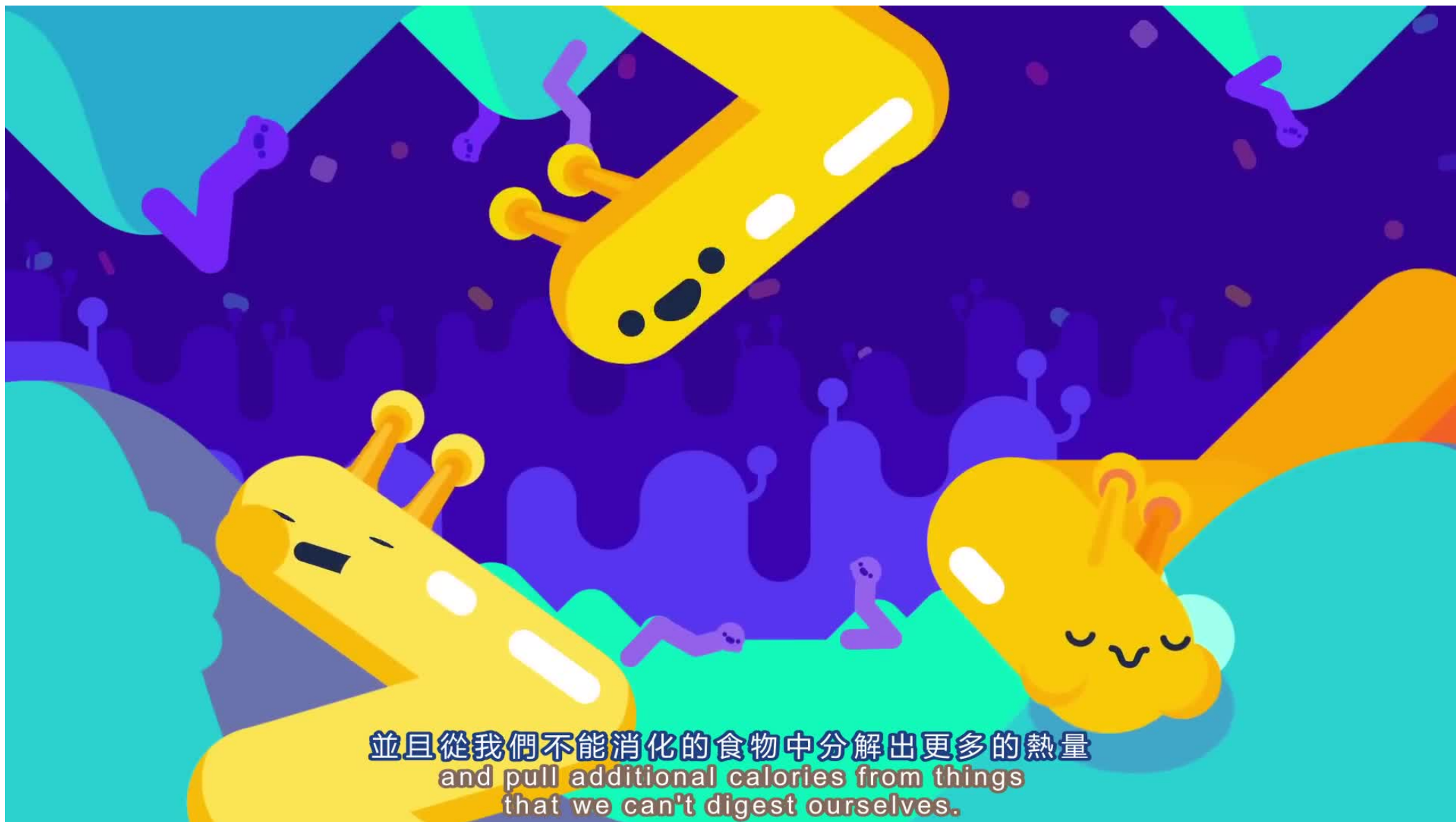


有超過5,000種不同的物種，住在我們腸道中
from up to 5,000 different species,
that live in our gut.

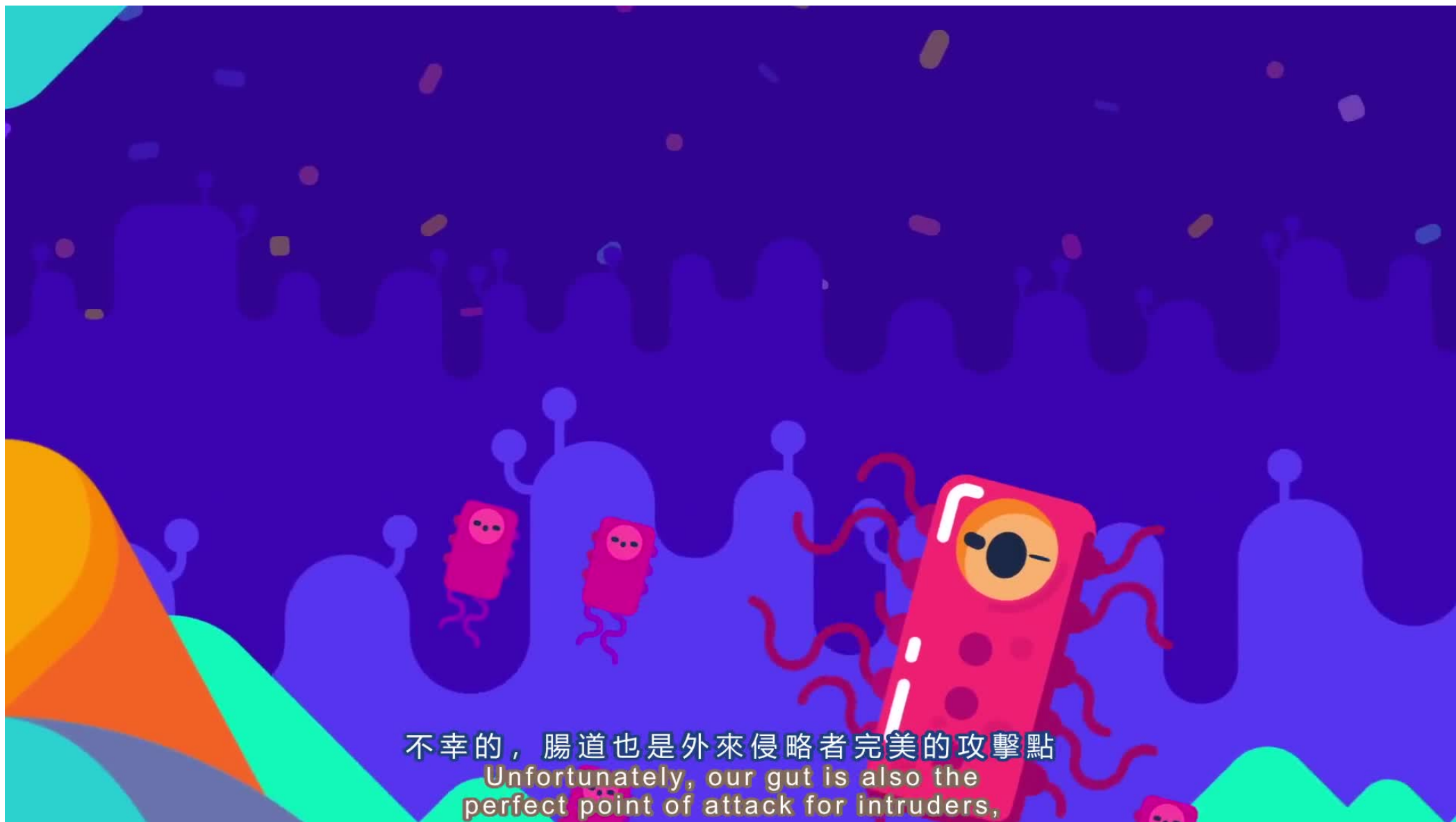


這些腸道微生物幫助我們消化食物

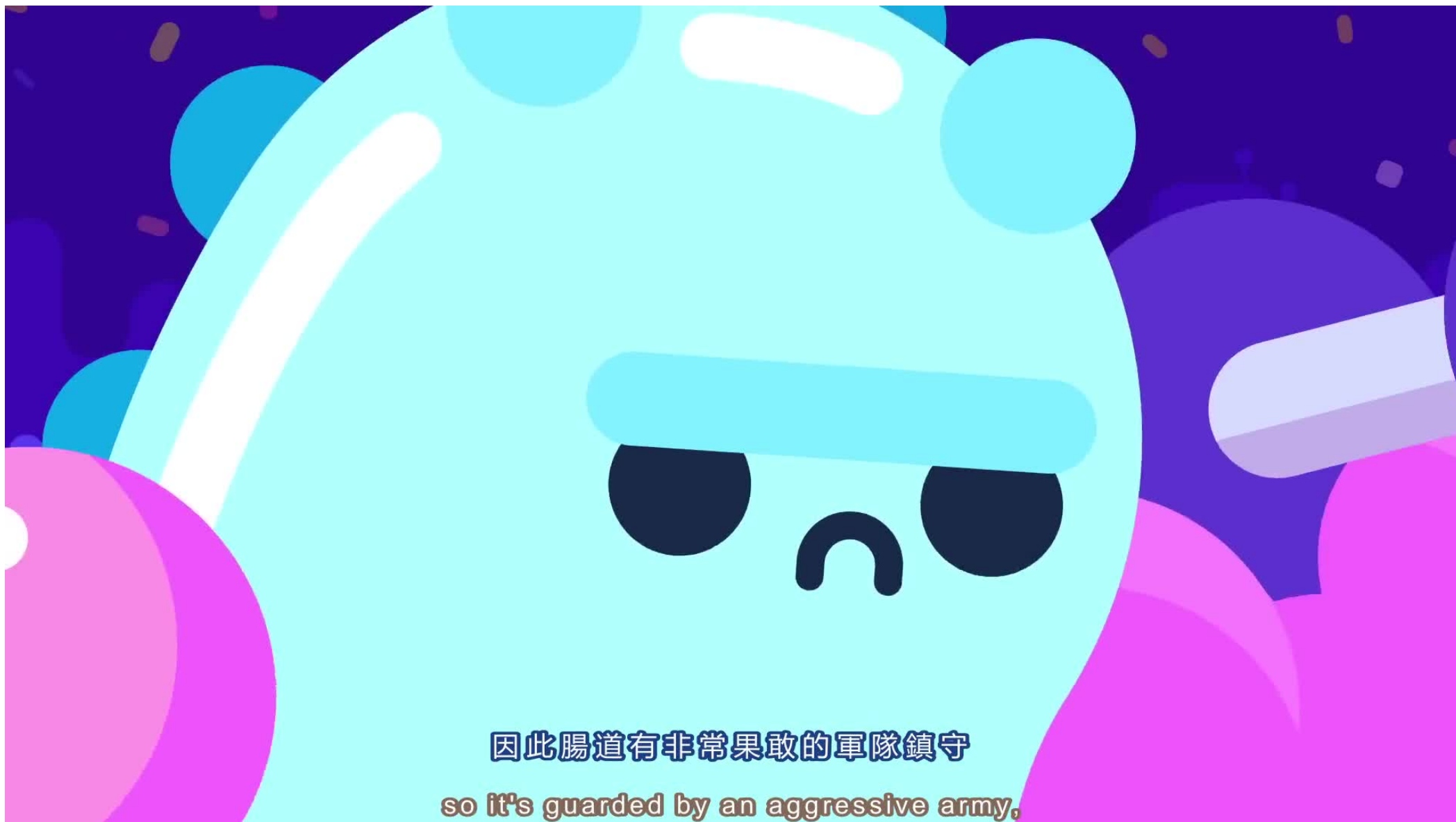
These gut microorganisms help us digest food,



並且從我們不能消化的食物中分解出更多的熱量
and pull additional calories from things
that we can't digest ourselves.

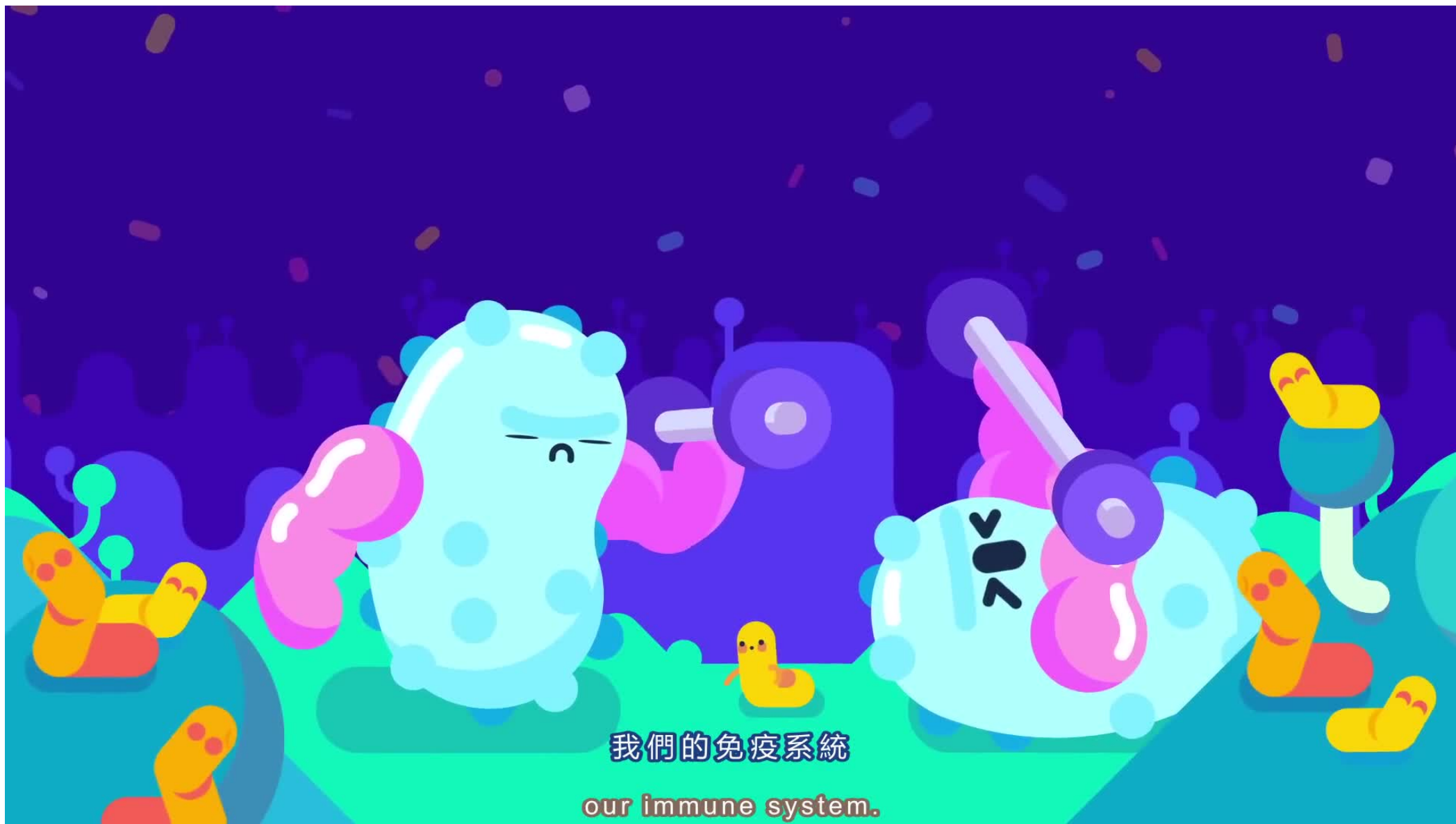


不幸的，腸道也是外來侵略者完美的攻擊點
Unfortunately, our gut is also the
perfect point of attack for intruders,



因此腸道有非常果敢的軍隊鎮守

so it's guarded by an aggressive army,



我們的免疫系統

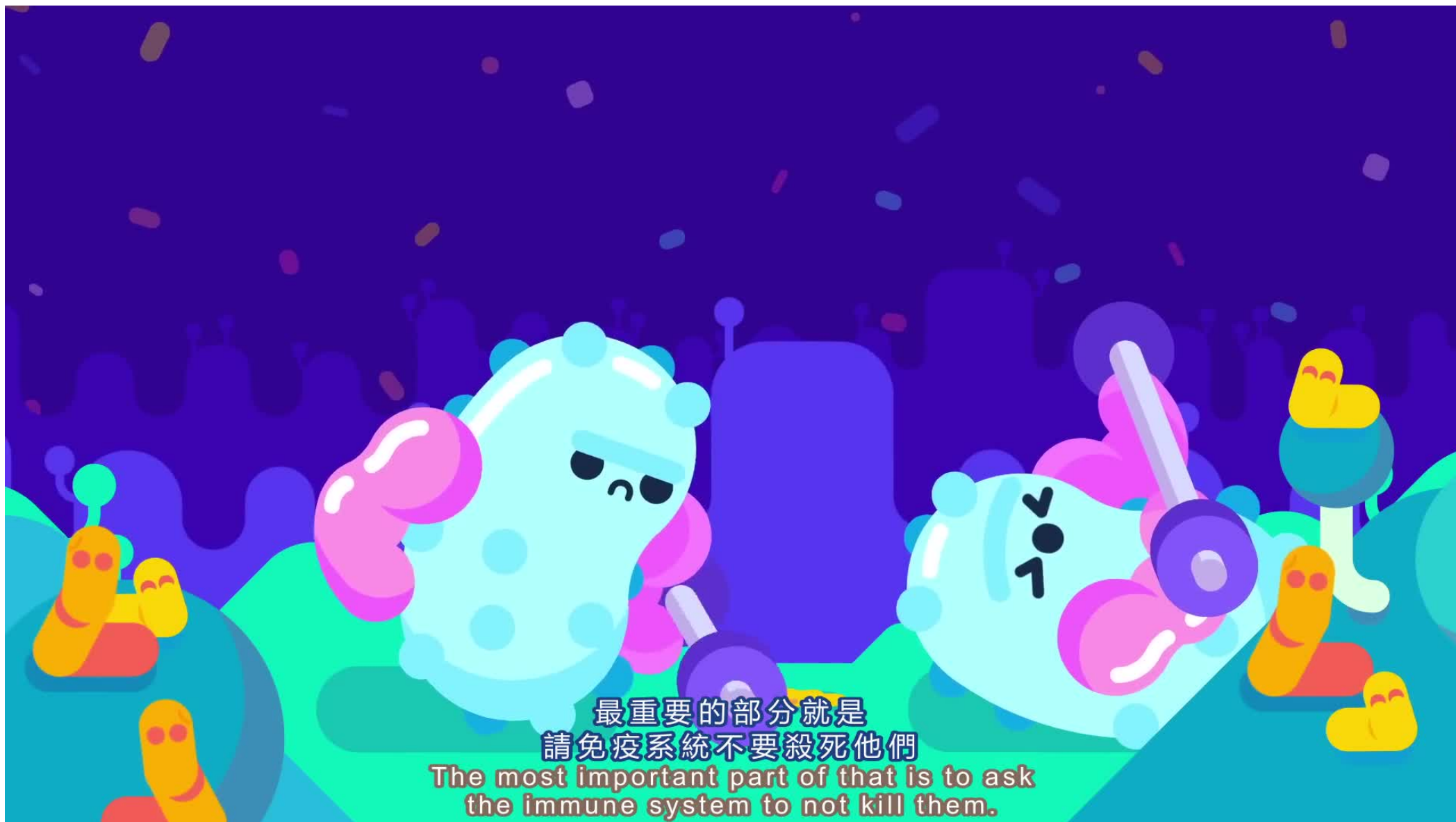
our immune system.



為了在此生存，微生物和我們共同演化
To survive here, our microbiome
co-evolved with us



使自己有能力與我們身體聯絡
to be able to communicate
with our body.



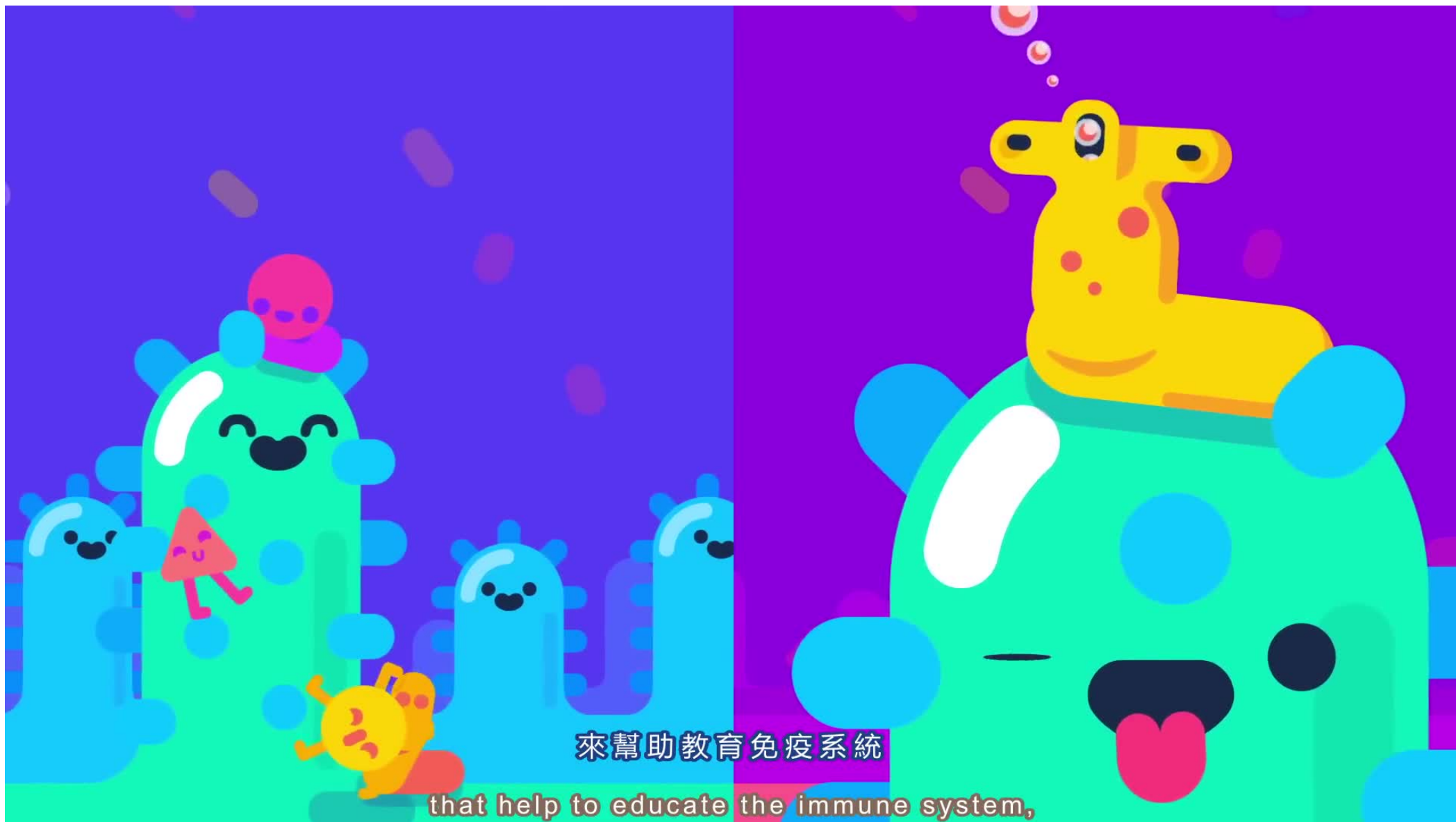
最重要的部分就是
請免疫系統不要殺死他們

The most important part of that is to ask
the immune system to not kill them.





所以某些微生物會產出一種訊息物質
so some of them produce a
messenger substances,

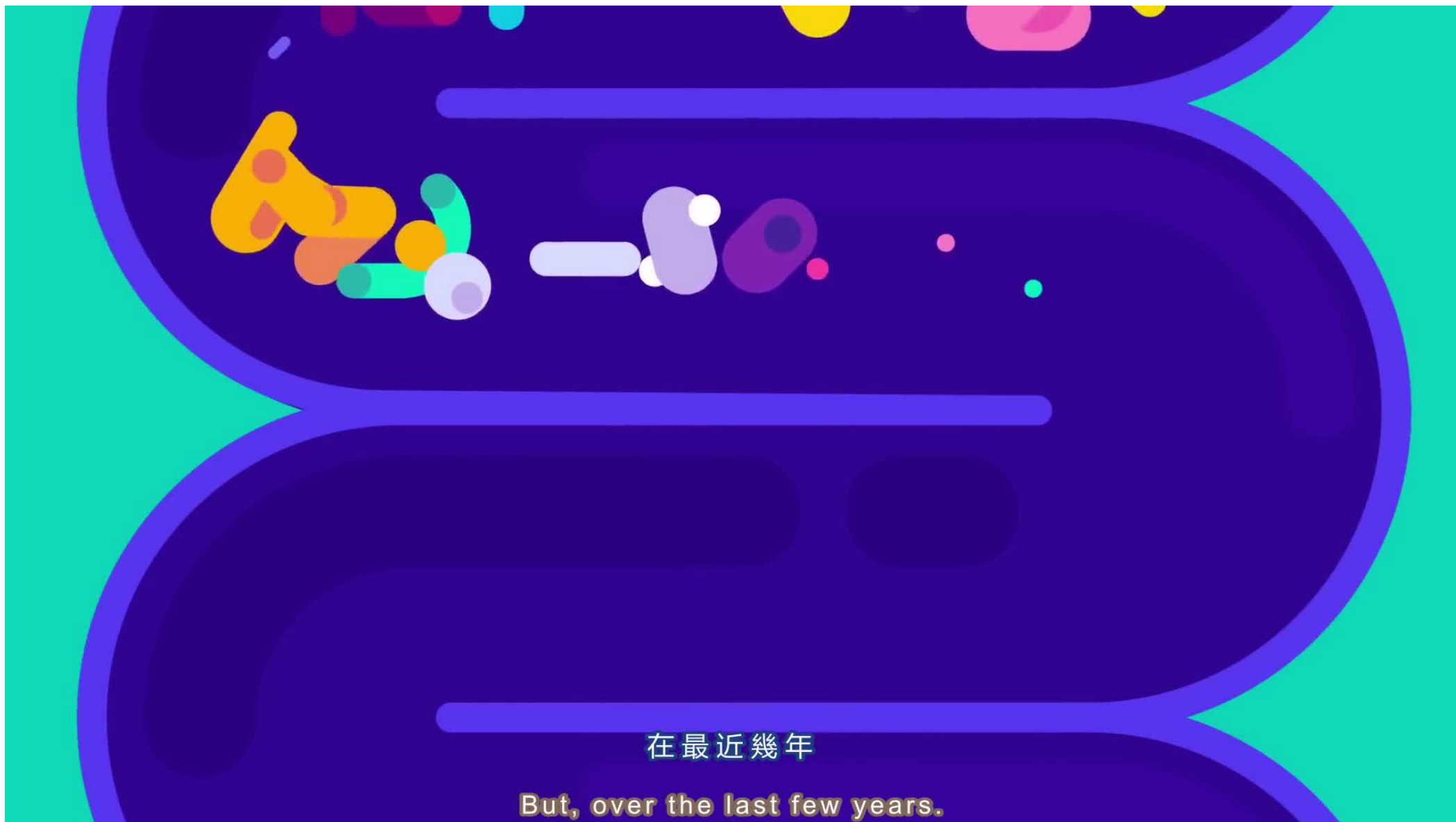


來幫助教育免疫系統

that help to educate the immune system,

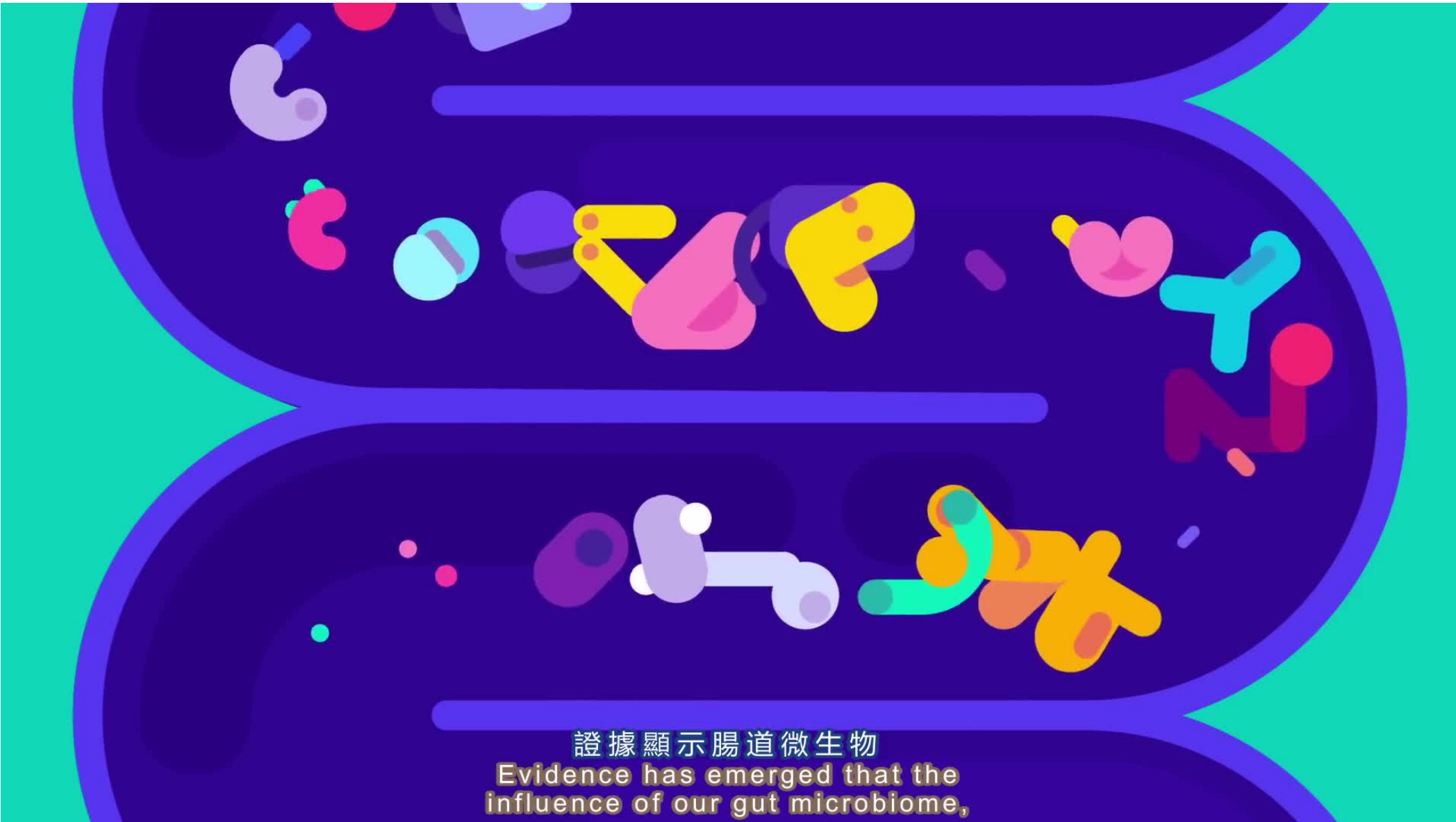


其他還有些微生物能刺激腸道細胞再生
and others stimulate the gut cells
to regenerate faster.



在最近幾年

But, over the last few years.

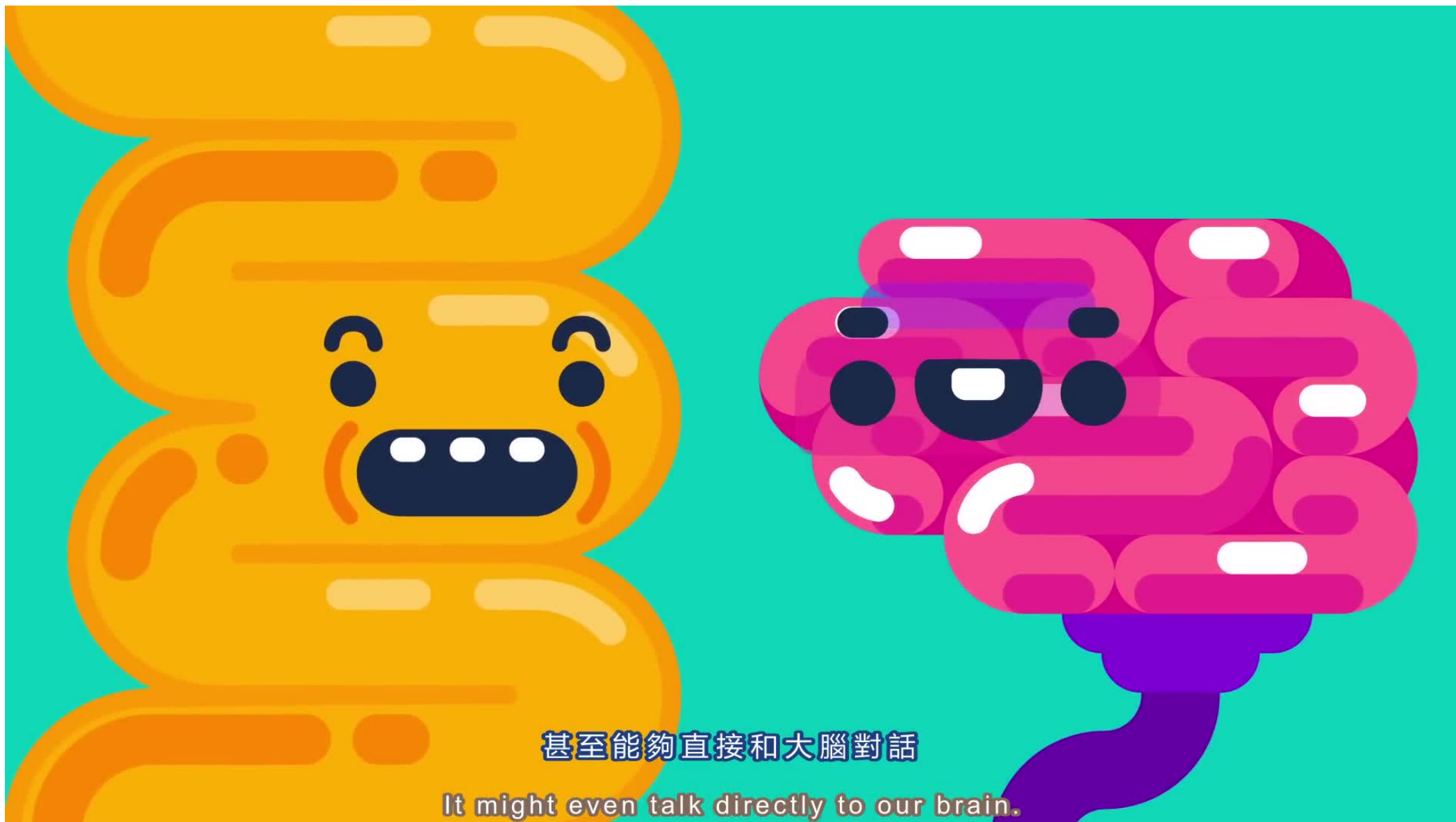
A stylized illustration of a human gut, represented by a large, dark blue, rounded shape with a central horizontal tube. The gut is filled with various colorful, abstract shapes representing different types of gut microbiota. These shapes include circles, ovals, and more complex, branching structures in shades of yellow, pink, blue, and orange. The background of the entire image is a solid teal color.

證據顯示腸道微生物
Evidence has emerged that the
influence of our gut microbiome,



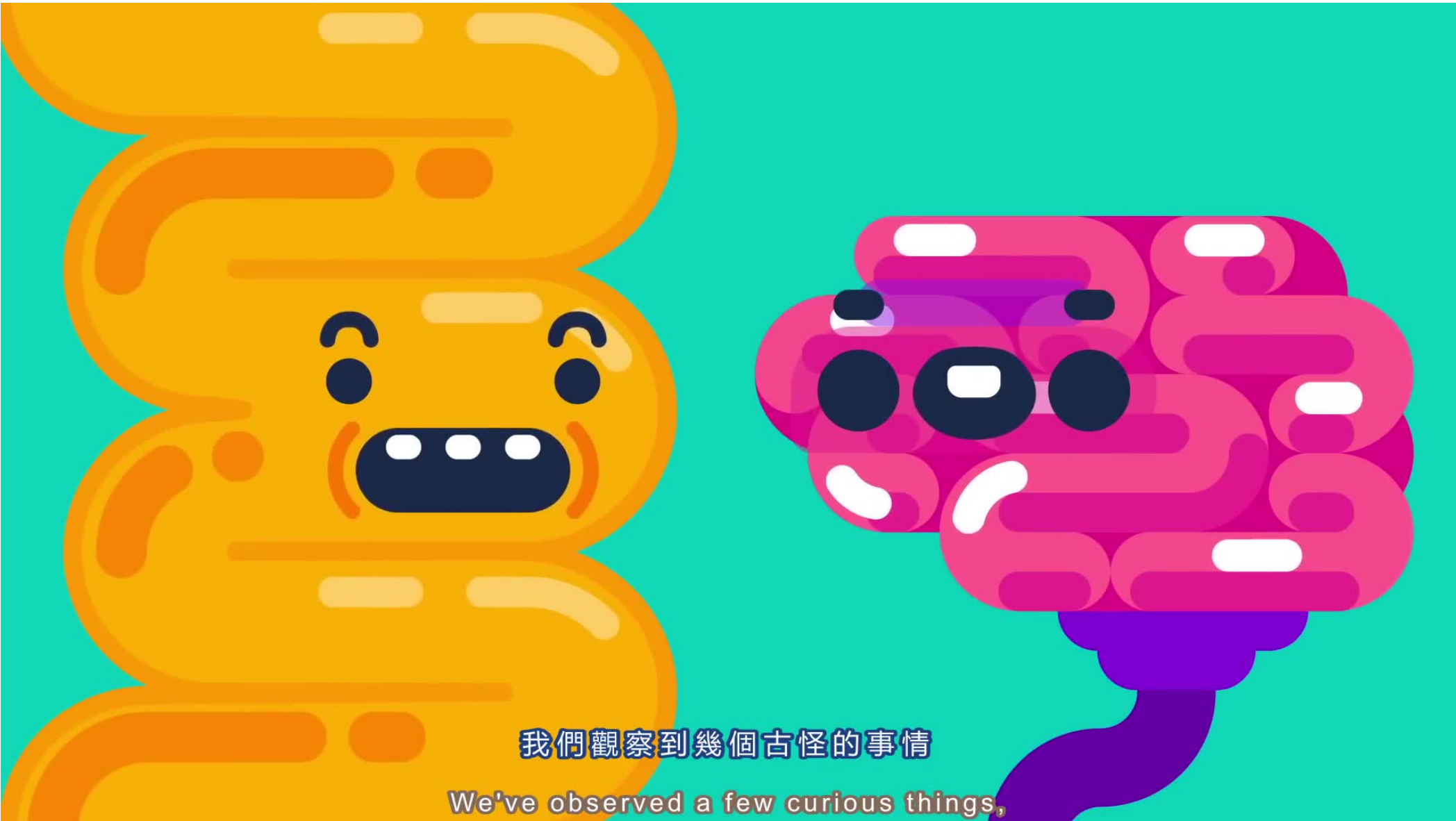
能影響的程度更遠了

goes much much further.



甚至能夠直接和大腦對話

It might even talk directly to our brain.



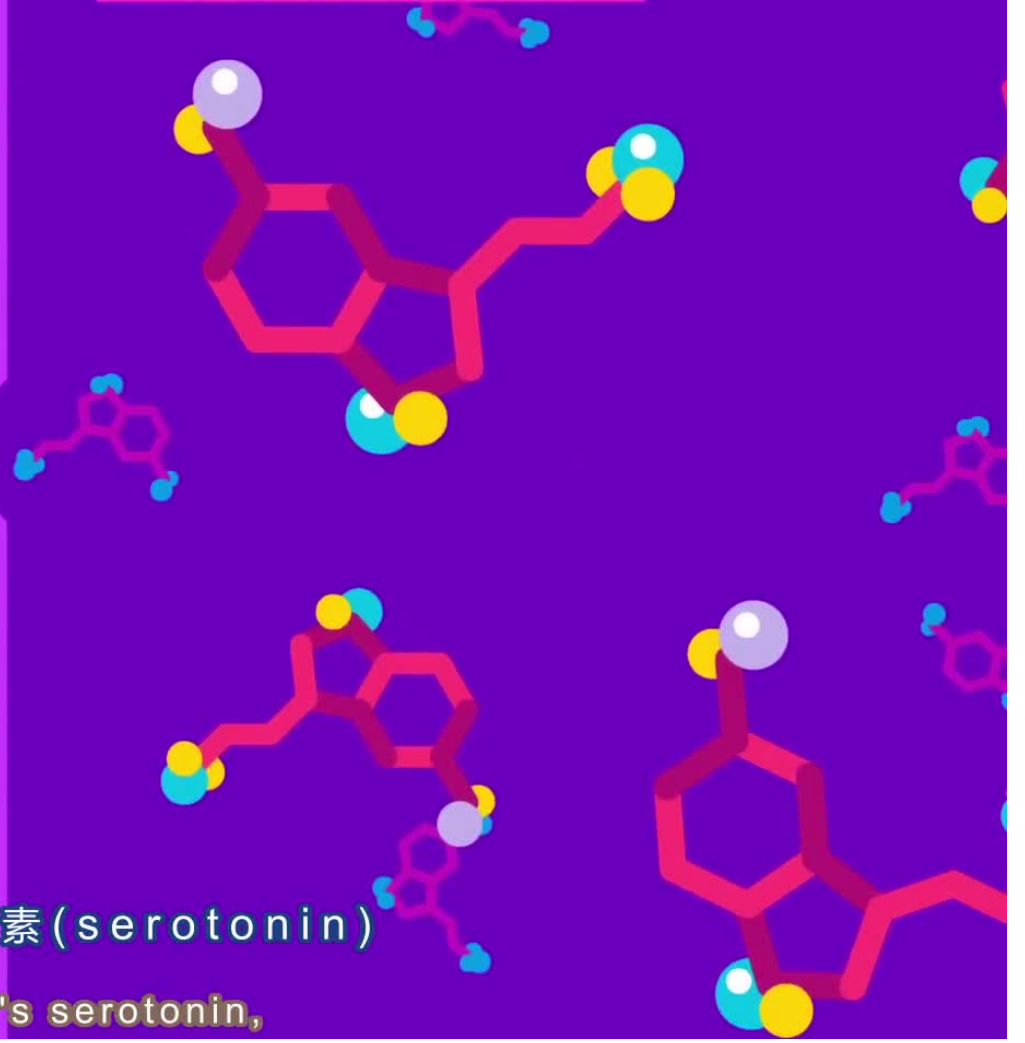
我們觀察到幾個古怪的事情

We've observed a few curious things,

SEROTONIN

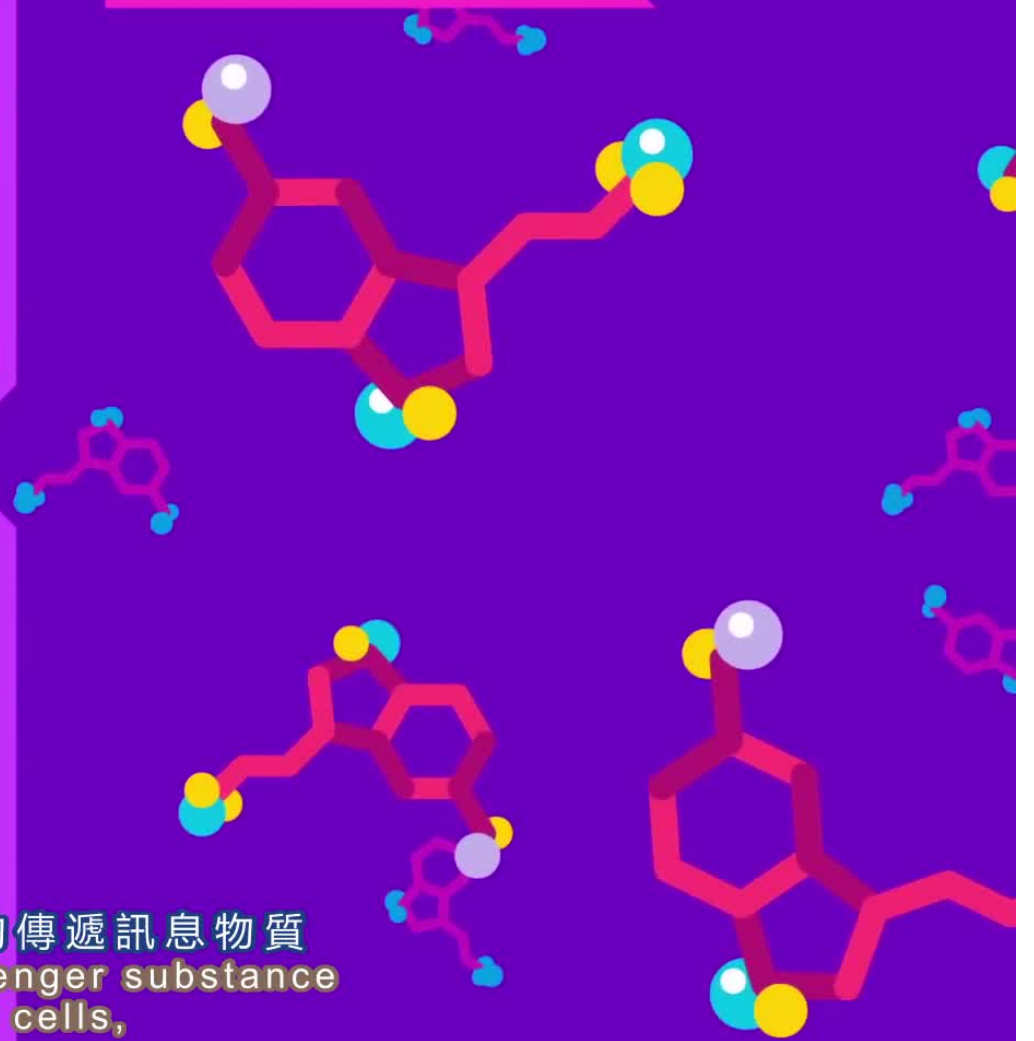
我們身體90%的血清素(serotonin)

90% of our body's serotonin,

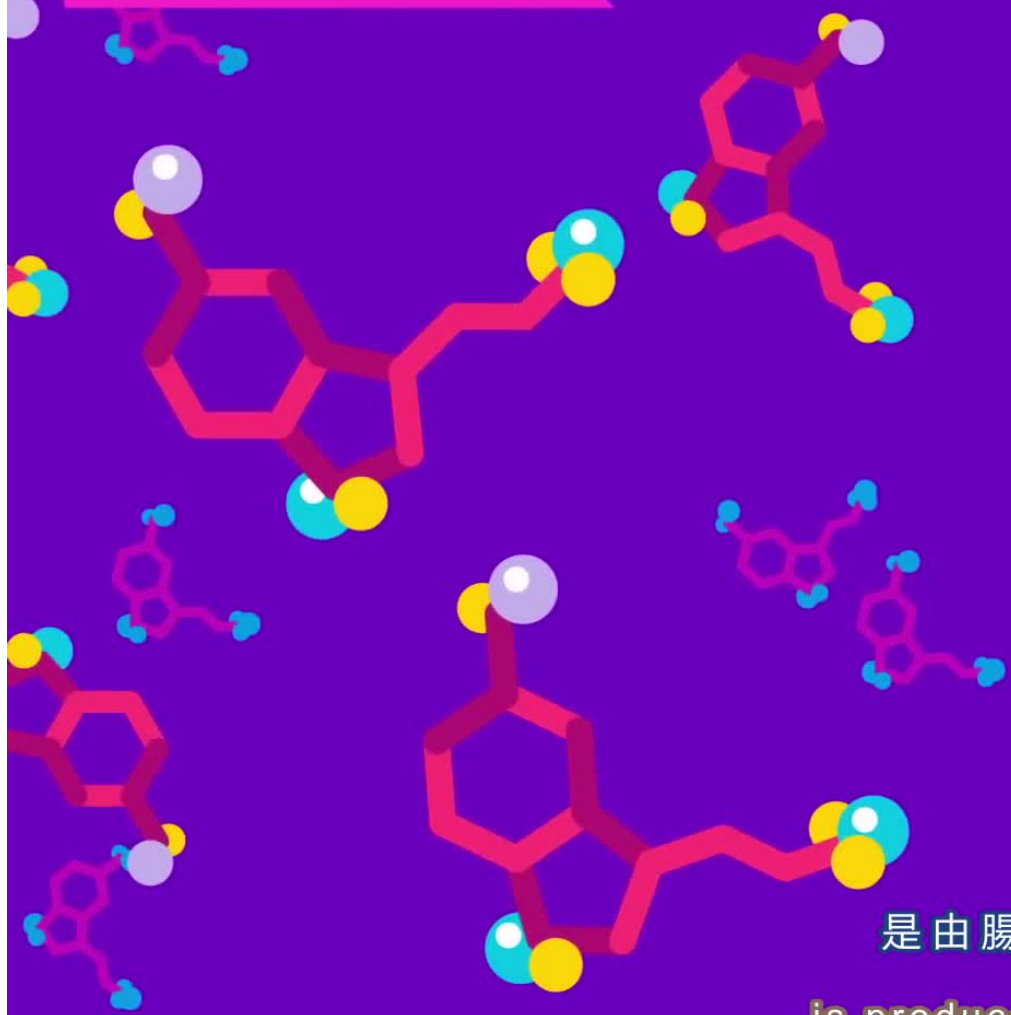


SEROTONIN

是神經細胞重要的傳遞訊息物質
an important messenger substance
for nerve cells,



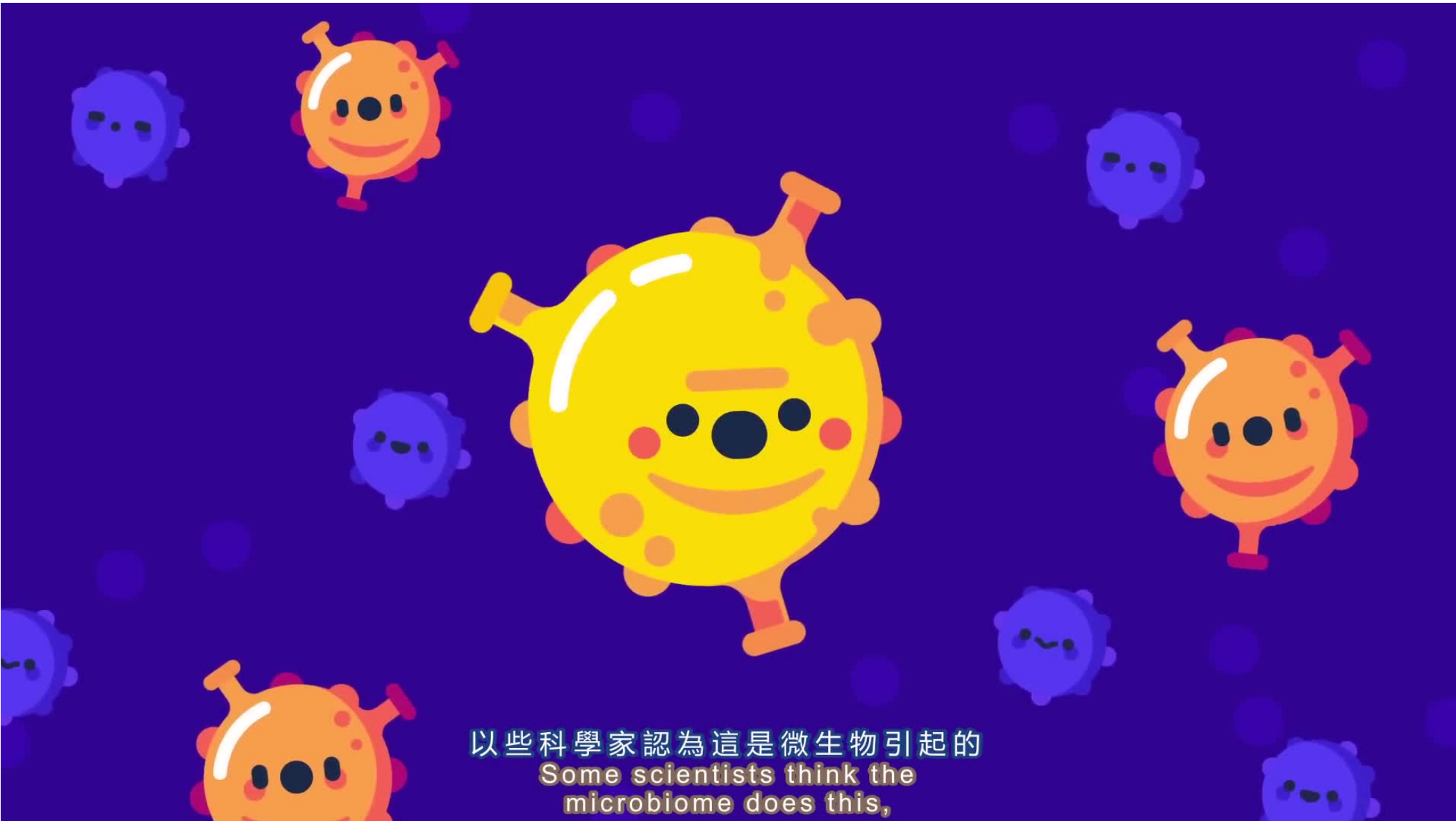
SEROTONIN



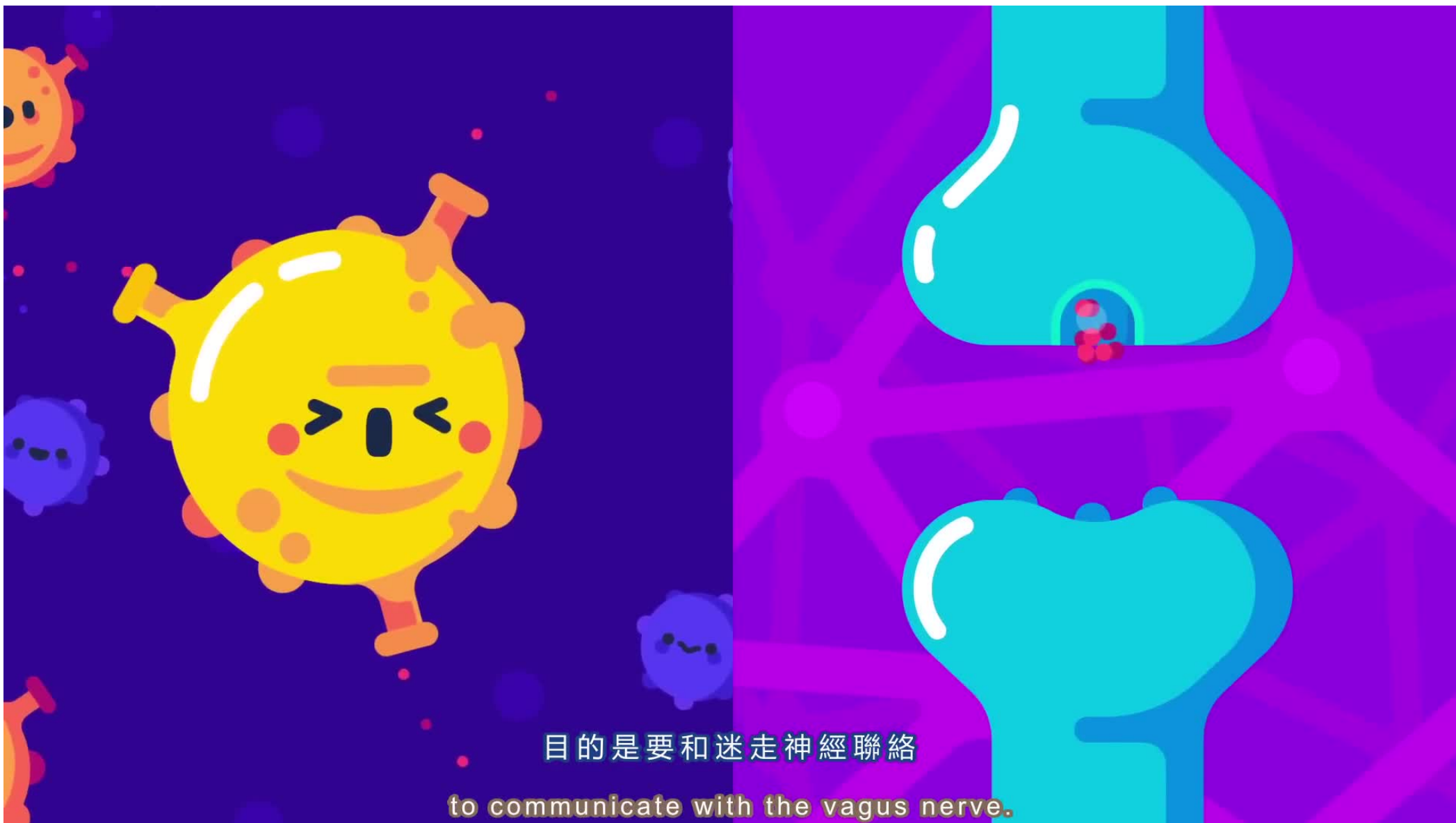
是由腸道製造的

is produced in the gut.





以些科學家認為這是微生物引起的
Some scientists think the
microbiome does this,



目的是要和迷走神經聯絡
to communicate with the vagus nerve.



迷走神經是我們神經系統訊息傳遞的高速公路

The information highway of our nervous system.

GUT

其他例子還包含有細菌能刺激腸道的免疫細胞

Other examples are bacteria that
stimulate immune cells in the gut,

GUT

然後傳送警告訊息給大腦
so they send a kind of alarm
signal to the brain.

GUT



BRAIN



這樣能活化免疫細胞，幫助大腦從創傷中恢復
Here, it activates immune cells that help
the brain recover from injuries.



由於大腦決定了我們吃什麼

Since the brain decides what we eat,

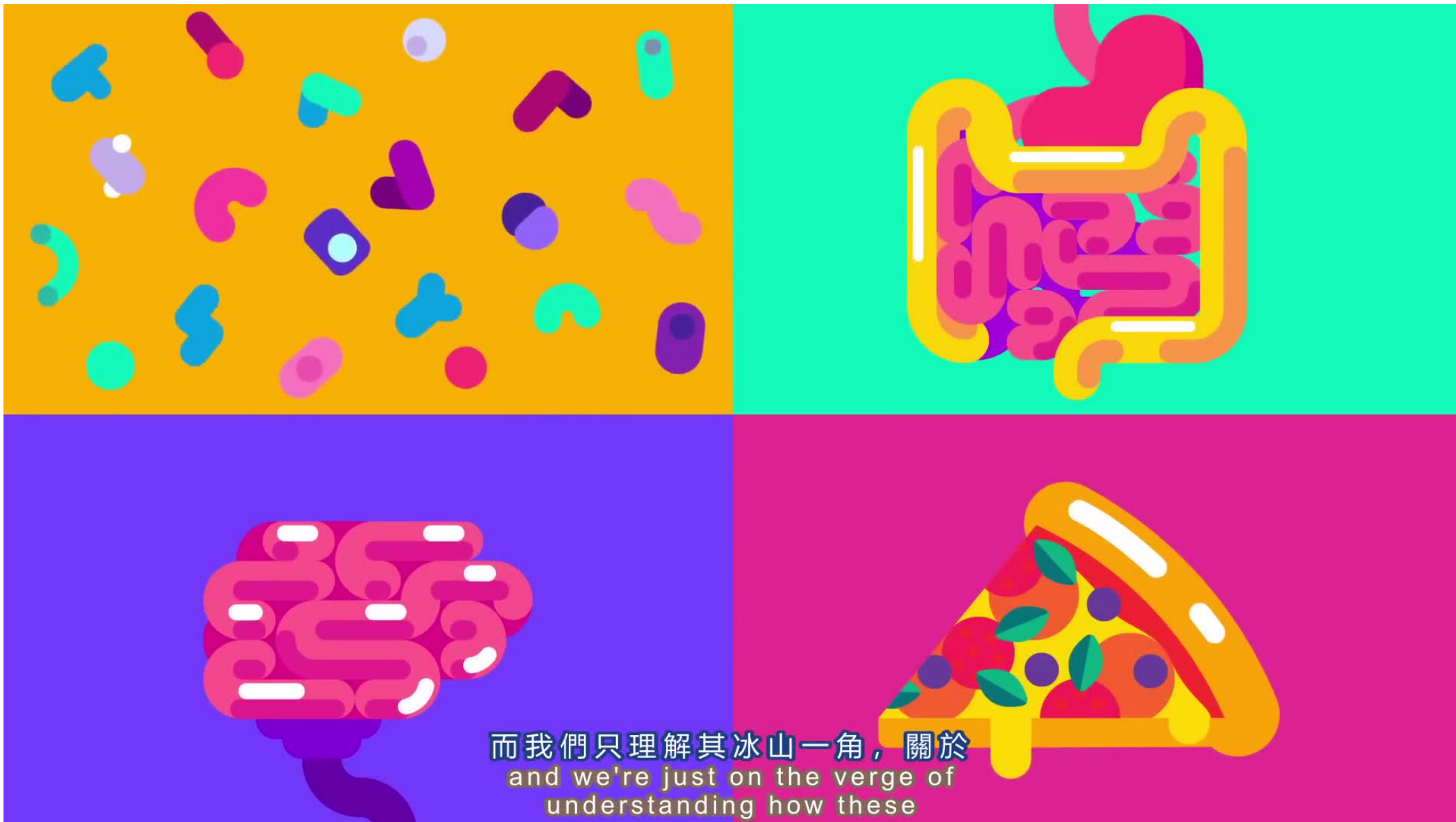


微生物們對健康的大腦非常有興趣
the microbiome is interested
in a healthy brain.

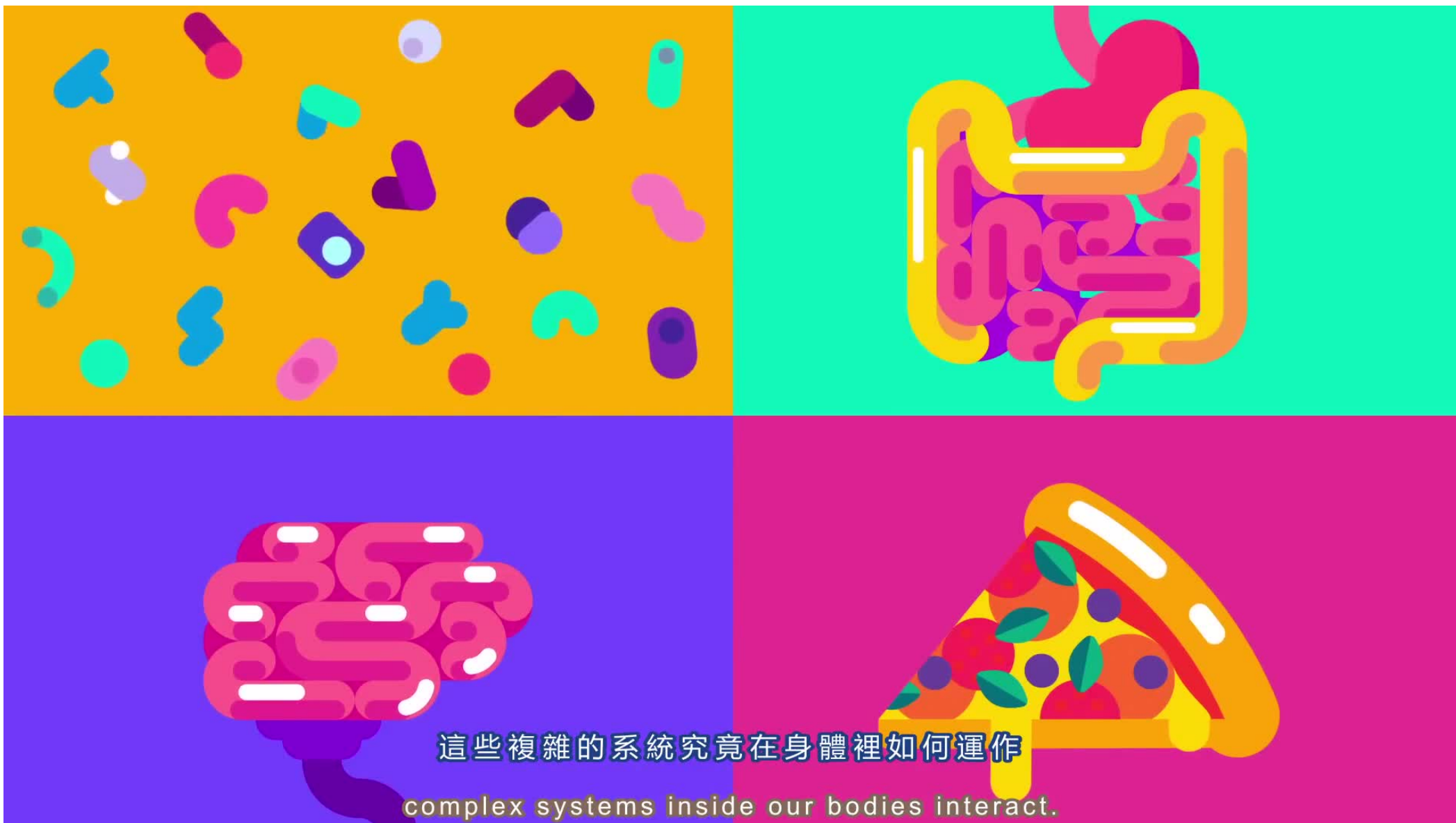


GUT SCIENCE

這裡開創了科學中新的領域
A new field of science is
opening up here,



而我們只理解其冰山一角，關於
and we're just on the verge of
understanding how these



這些複雜的系統究竟在身體裡如何運作

complex systems inside our bodies interact.



但我們逐漸開始瞭解
But we are starting to see how
much our microbiome



這些微生物影響我們及我們的行為有多深
actually influences us and our behavior.



以憂鬱為例

Take depression for example,



健康的大鼠被餵食來自憂鬱人類腸道的微生物
Healthy rats fed microbes from the
guts of depressed people,



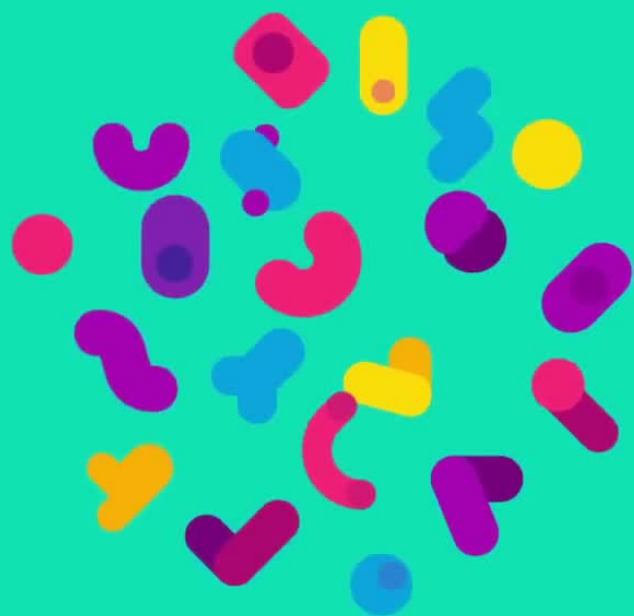
便會開始出現類似焦慮不安的行為

began showing anxiety-like behavior,



以及類似憂鬱的症狀

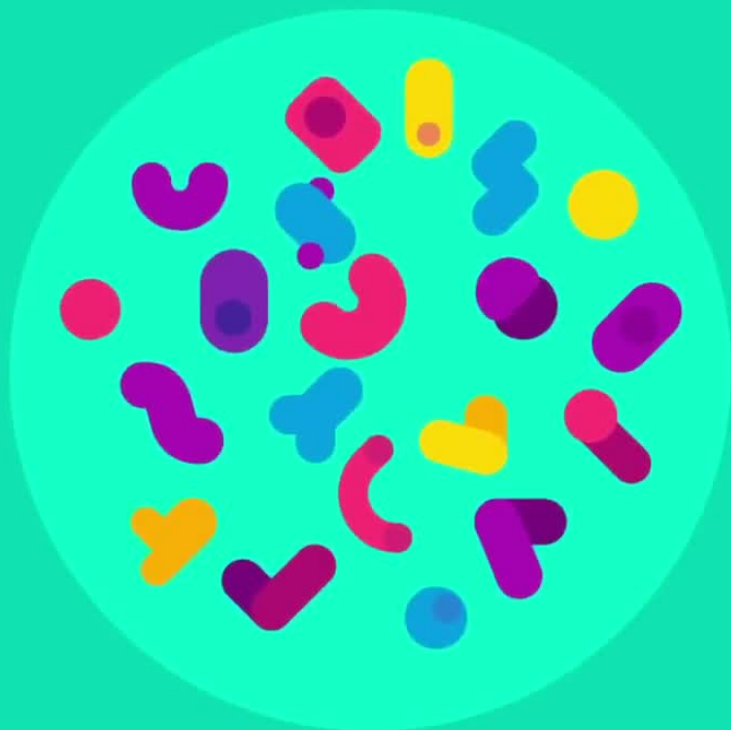
and symptoms that look like depression.



在2017年初一個研究指出微生物和智力之間的關係

And in early 2017, a study linked the
microbiome to intelligence,

SETUP A



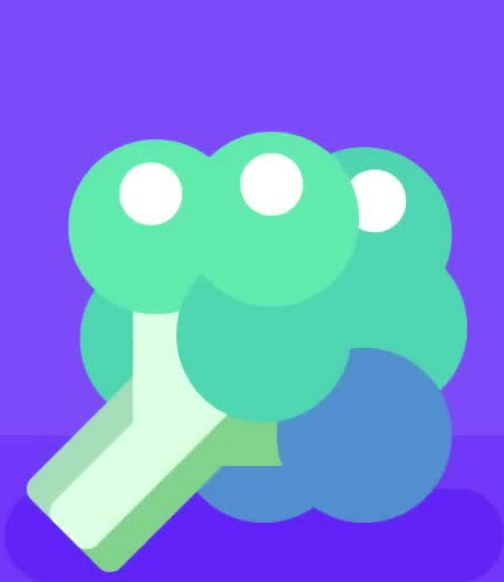
SETUP B



研究指出新生兒體內特別的一群細菌
by connecting a certain set up
of bacteria in newborns,



能使其擁有較好的運動及語言能力
with better motor and language skills.



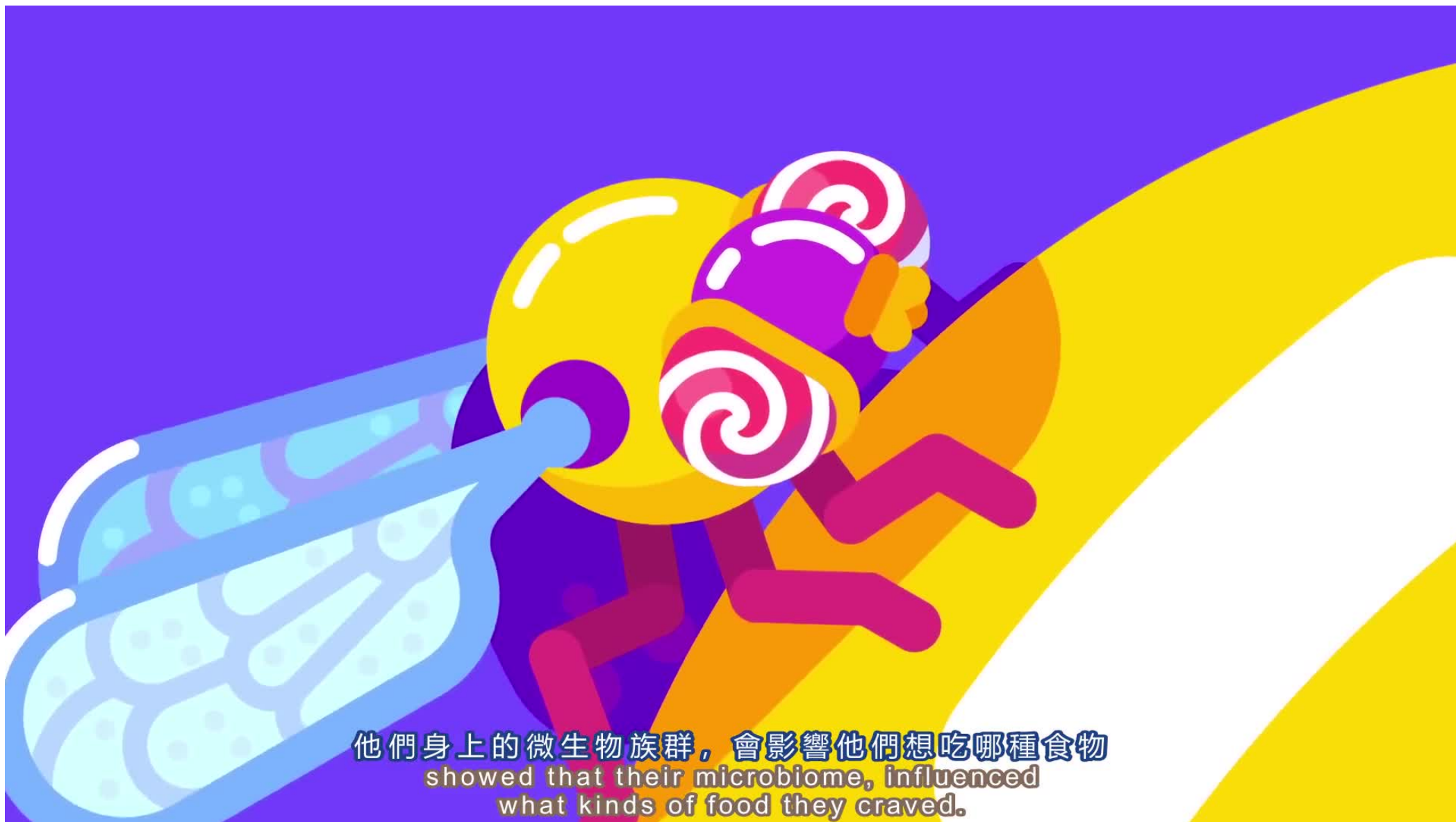
其也可能影響我們的日常生活

But it might also influence our daily lives.



以果蠅做研究時發現

Tests with fruit flies,



他們身上的微生物族群，會影響他們想吃哪種食物
showed that their microbiome, influenced
what kinds of food they craved.

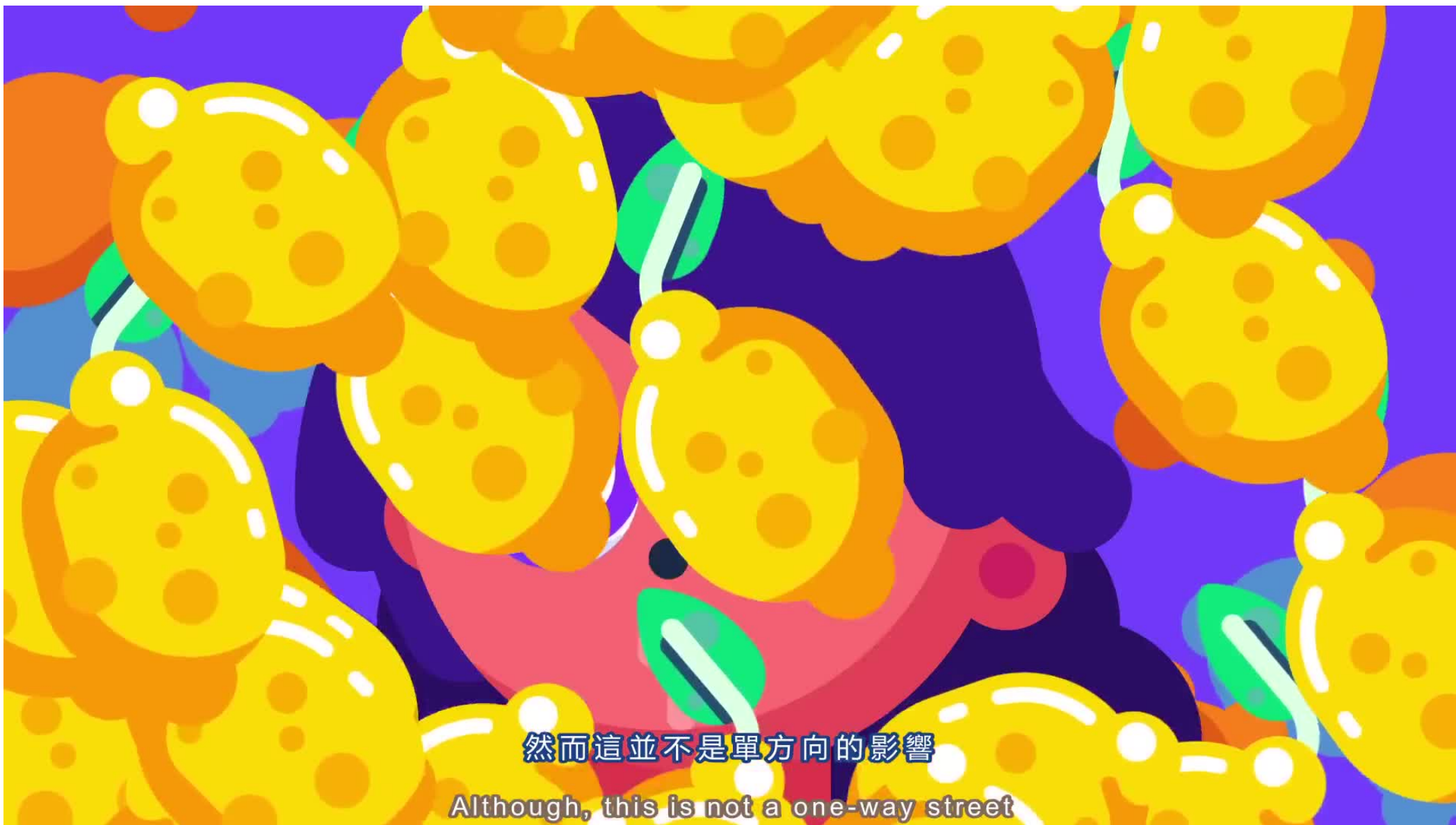


這可能指出，微生物能告訴你的大腦
This could mean your microbes are
able to tell your brain,



你該吃哪些食物

which food it should get them.



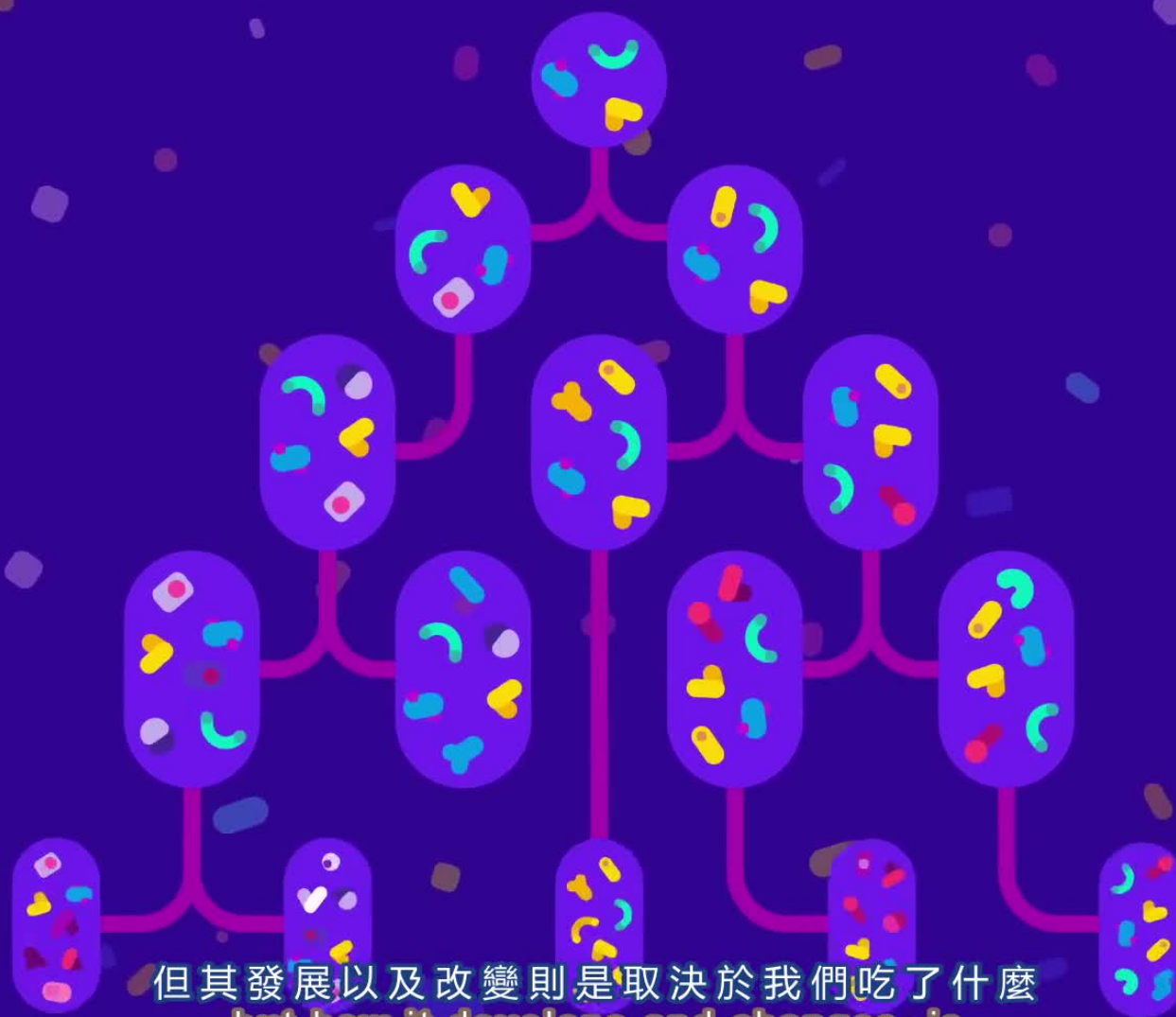
然而這並不是單方向的影響

Although, this is not a one-way street



MOM

我們身上微生物源自母親
The seed for our microbiome
comes from our mother,



但其發展以及改變則是取決於我們吃了什麼
but how it develops and changes, is
determined by what we eat.



腸道微生物以不同的食物為食
the organisms in our gut feed
on different things,



有些喜歡纖維類和葉菜類植物
some like fibers and leafy greens,



有些則喜歡糖類和澱粉類
others go for sugars and starches,



有些喜歡油炸食物、油脂類
and some love greasy fries and butter.



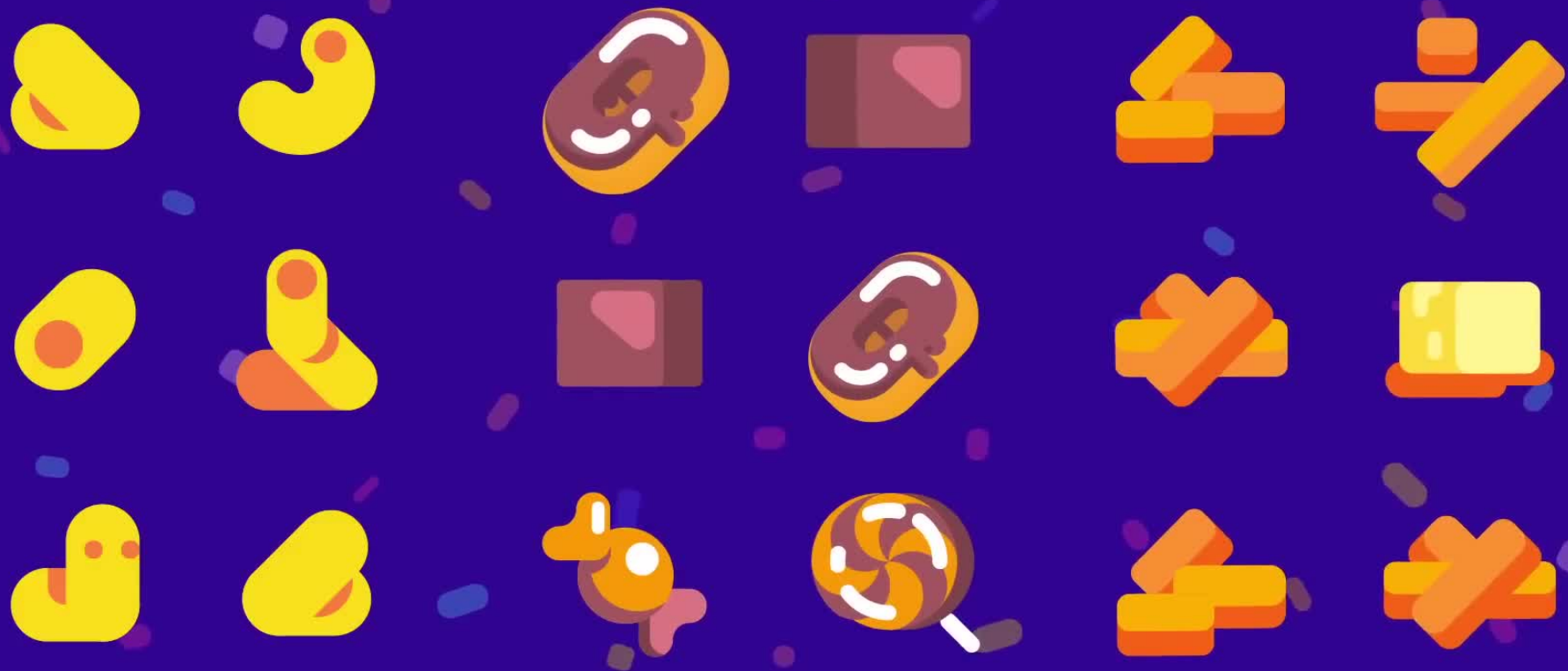
我們的腸道就像個花園一樣，在這裡我們不斷地決定
Our gut is like a garden in which
we constantly decide,



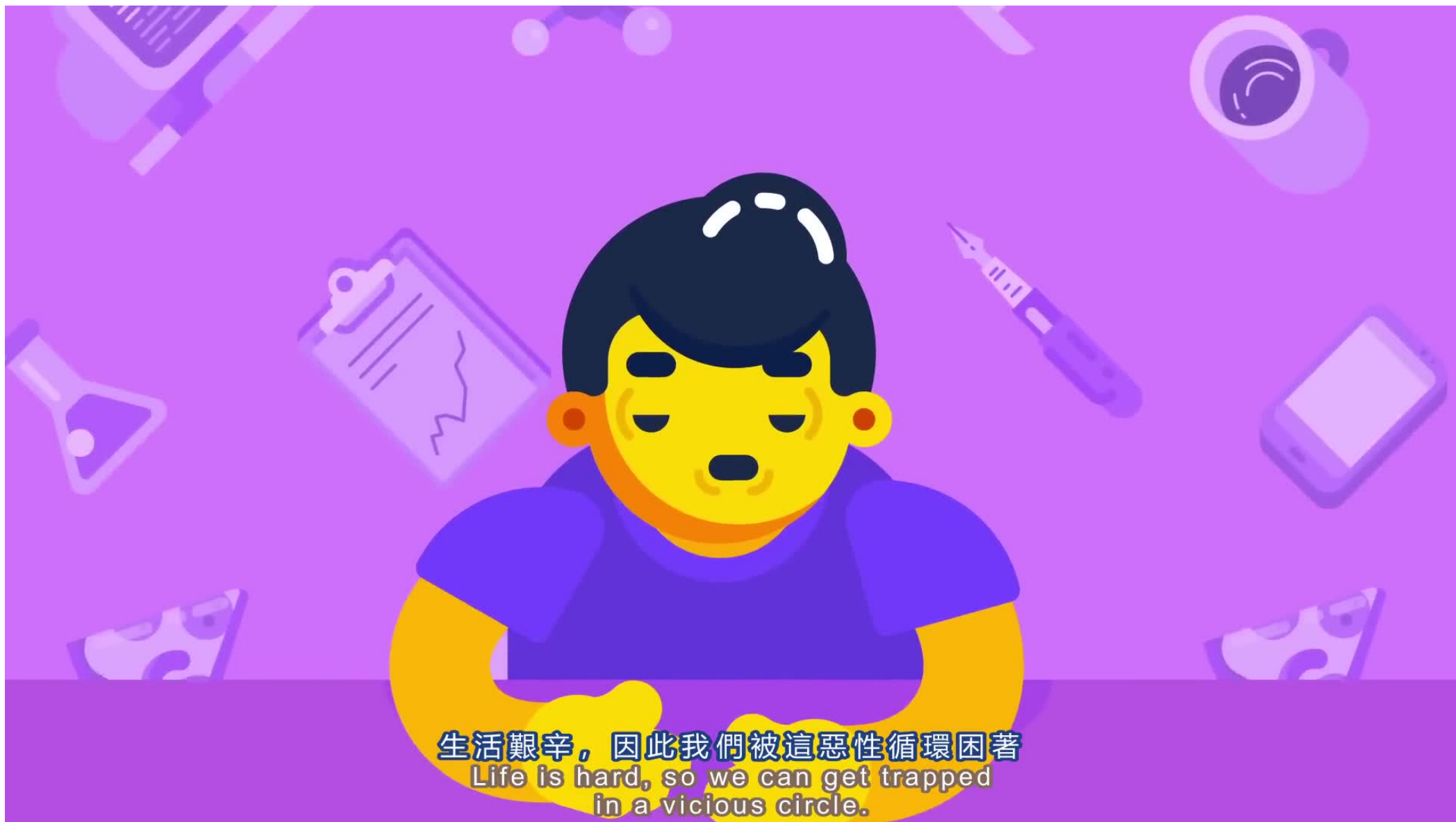
我們想要栽種繁盛什麼東西
what will grow and blossom.



如果我們飲食健康，就養育了那些喜歡健康食物的細菌
If we eat healthily, we breed bacteria
that like healthy food.



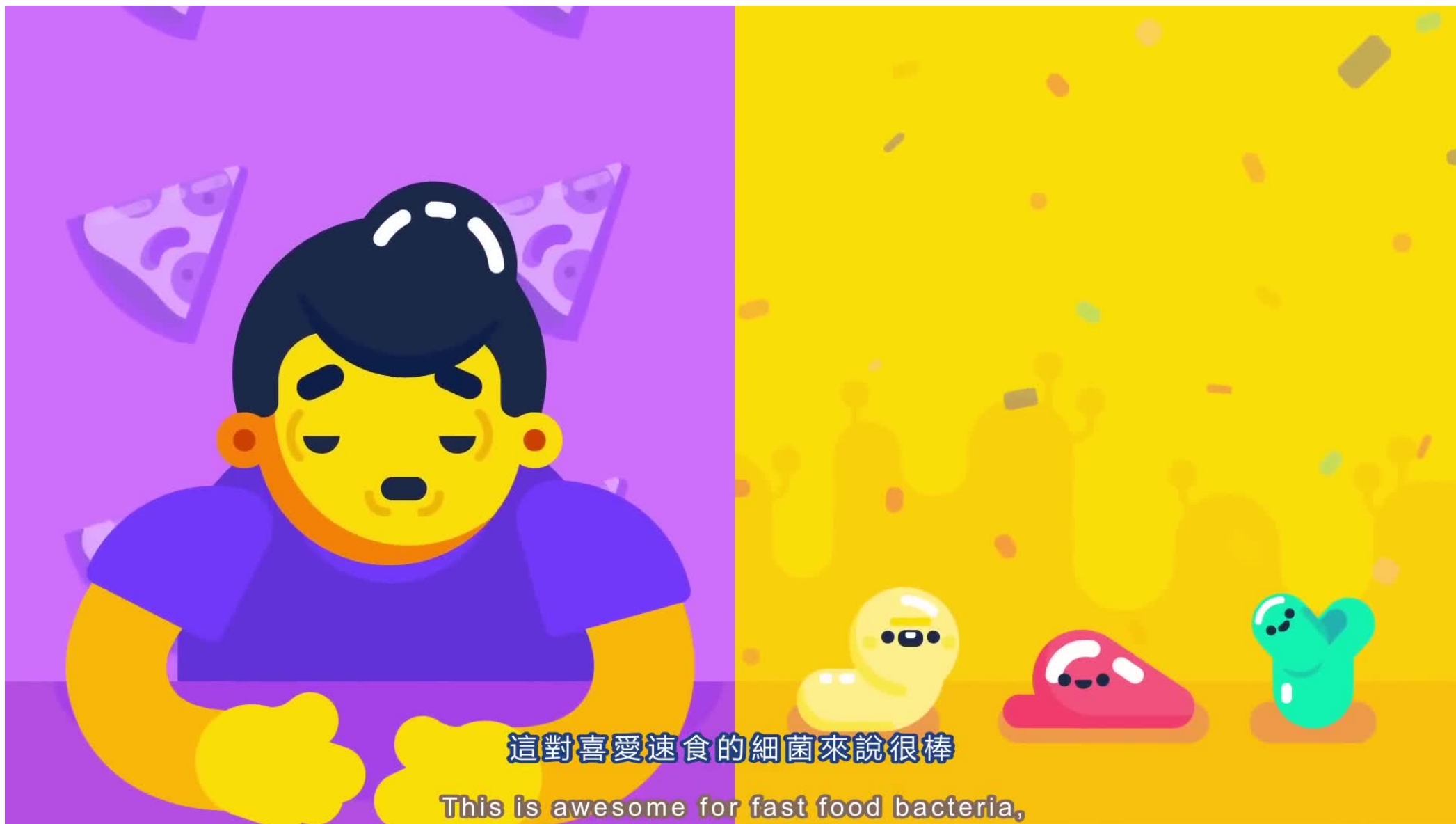
如果吃了很多速食，則養育了喜愛速食的細菌
If we eat a lot of fast food, then we
breed fast food loving bacteria.



生活艱辛，因此我們被這惡性循環困著
Life is hard, so we can get trapped
in a vicious circle.

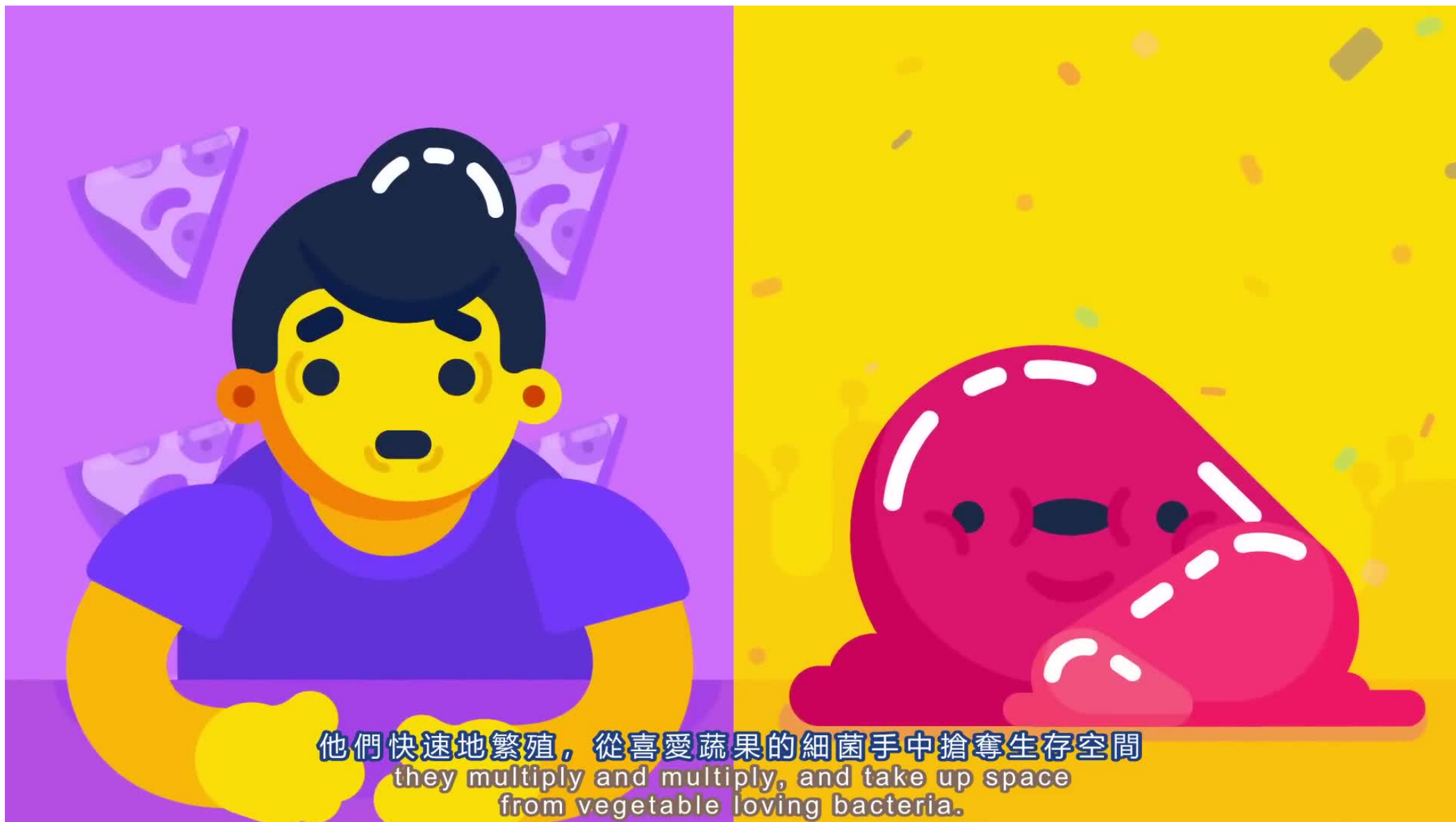


你處於壓力大的狀態時，吃了很多漢堡、薯條和披薩
You have a stressful time, and eat lots
of burgers and fries and pizza.



這對喜愛速食的細菌來說很棒

This is awesome for fast food bacteria,



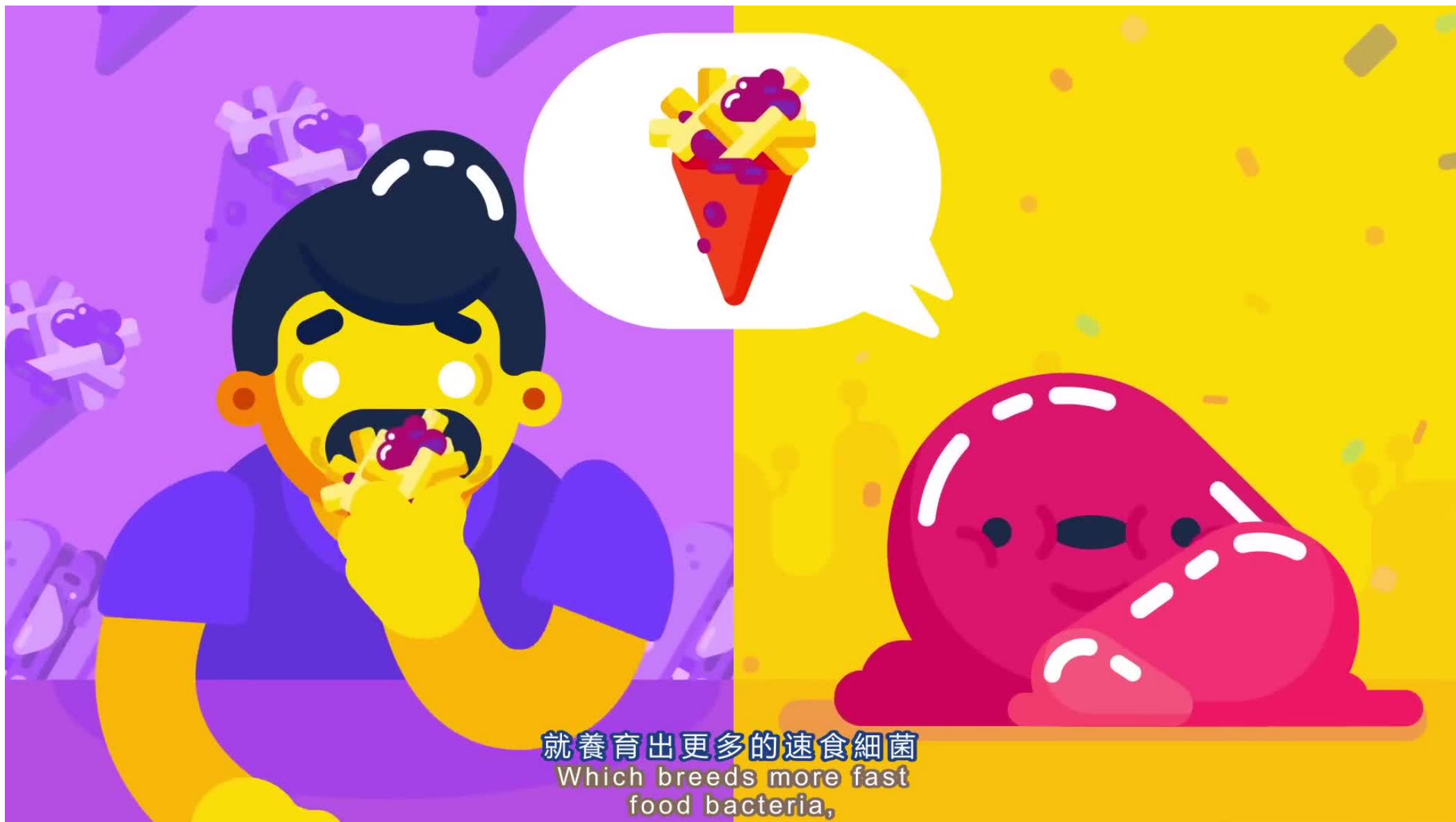
他們快速地繁殖，從喜愛蔬果的細菌手中搶奪生存空間
they multiply and multiply, and take up space
from vegetable loving bacteria.



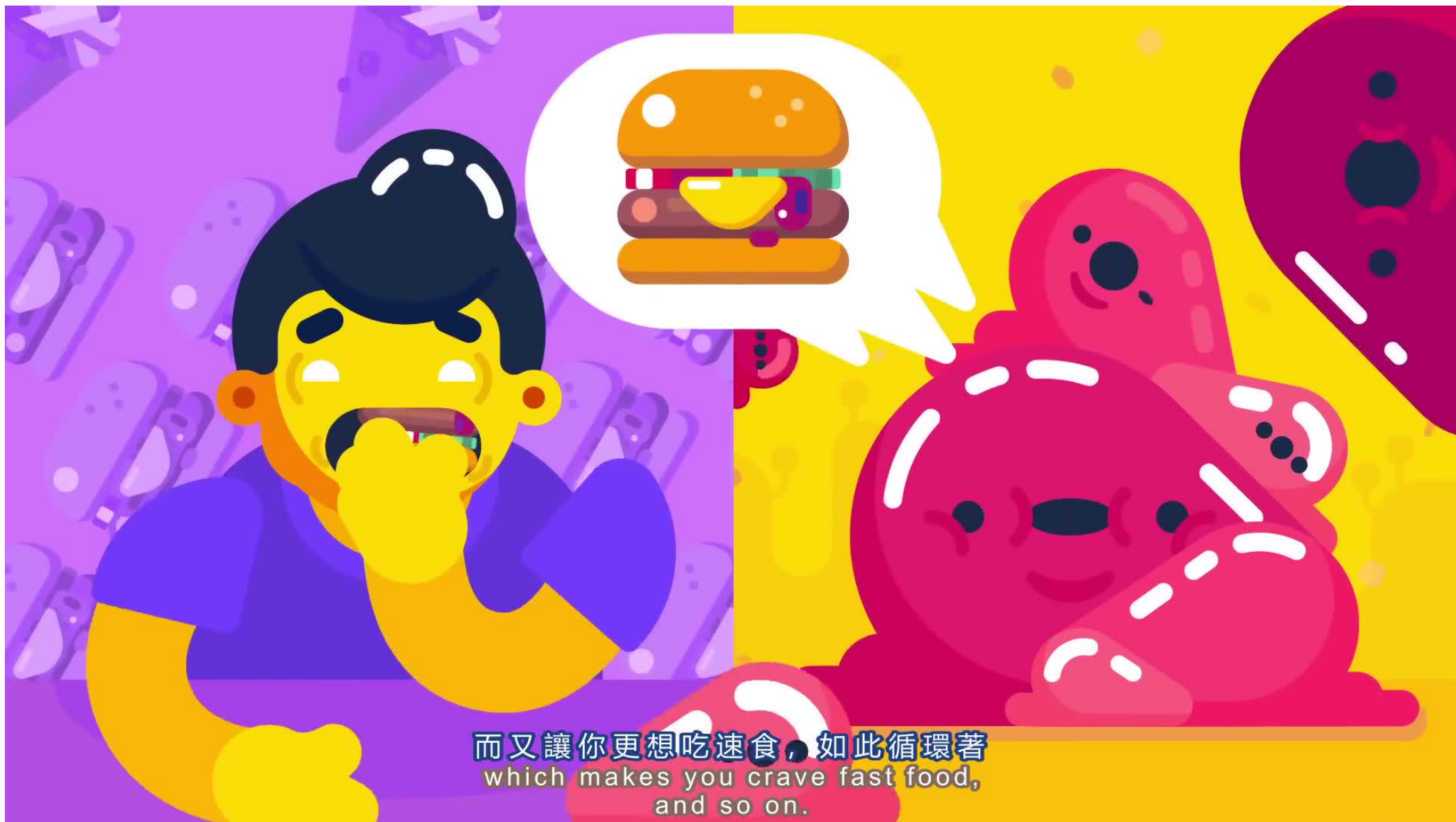
更糟的是，他們向大腦傳遞訊息要你繼續
But even worse, they send signals to the
brain to continue what it's doing.



進而讓你想要吃更多的速食
this makes you want more
fast food.



就養育出更多的速食細菌
Which breeds more fast
food bacteria,



而又讓你更想吃速食，如此循環著
which makes you crave fast food,
and so on.



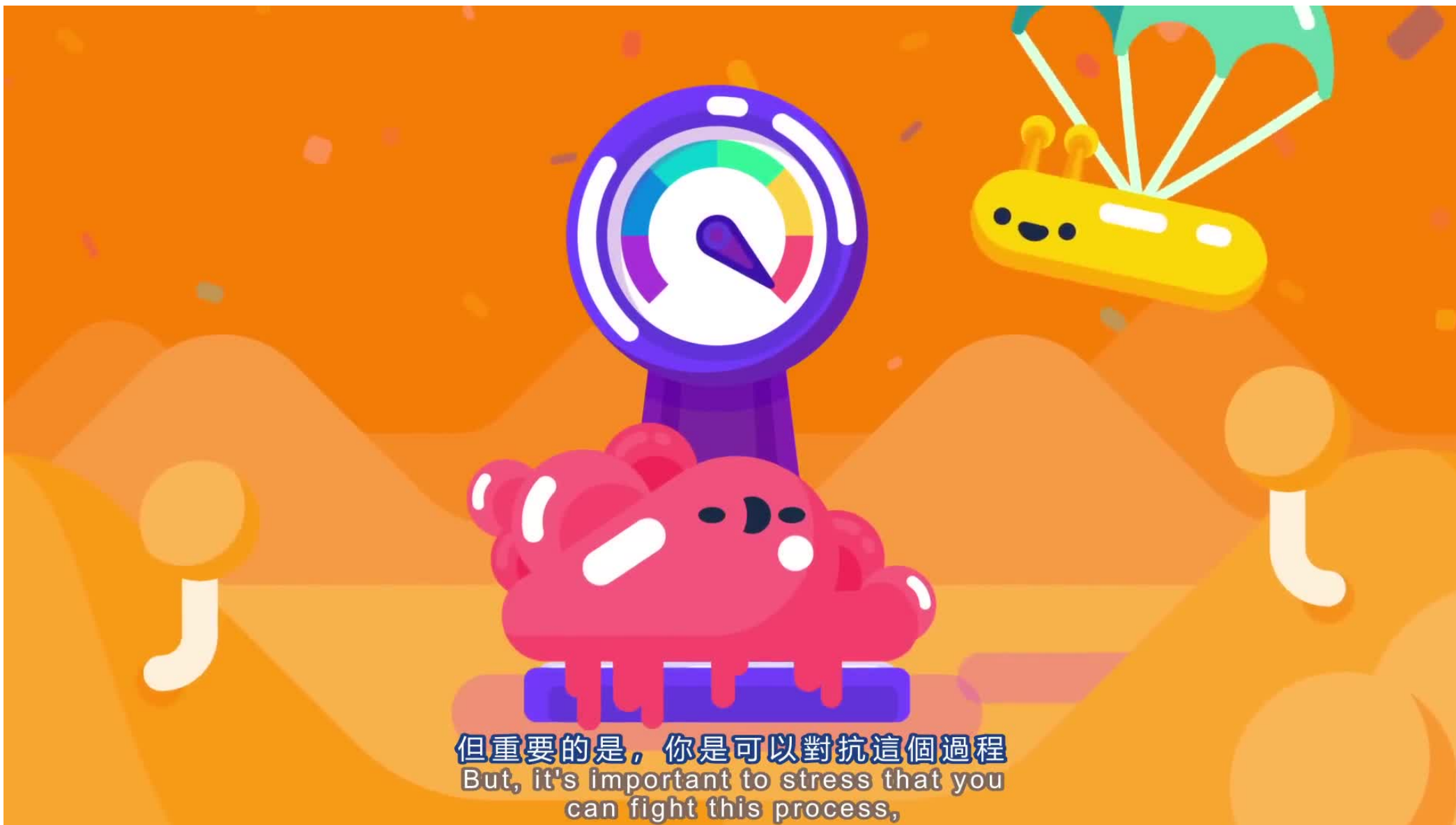
這樣自我回饋增強的循環

This kind of self-reinforcing cycle,

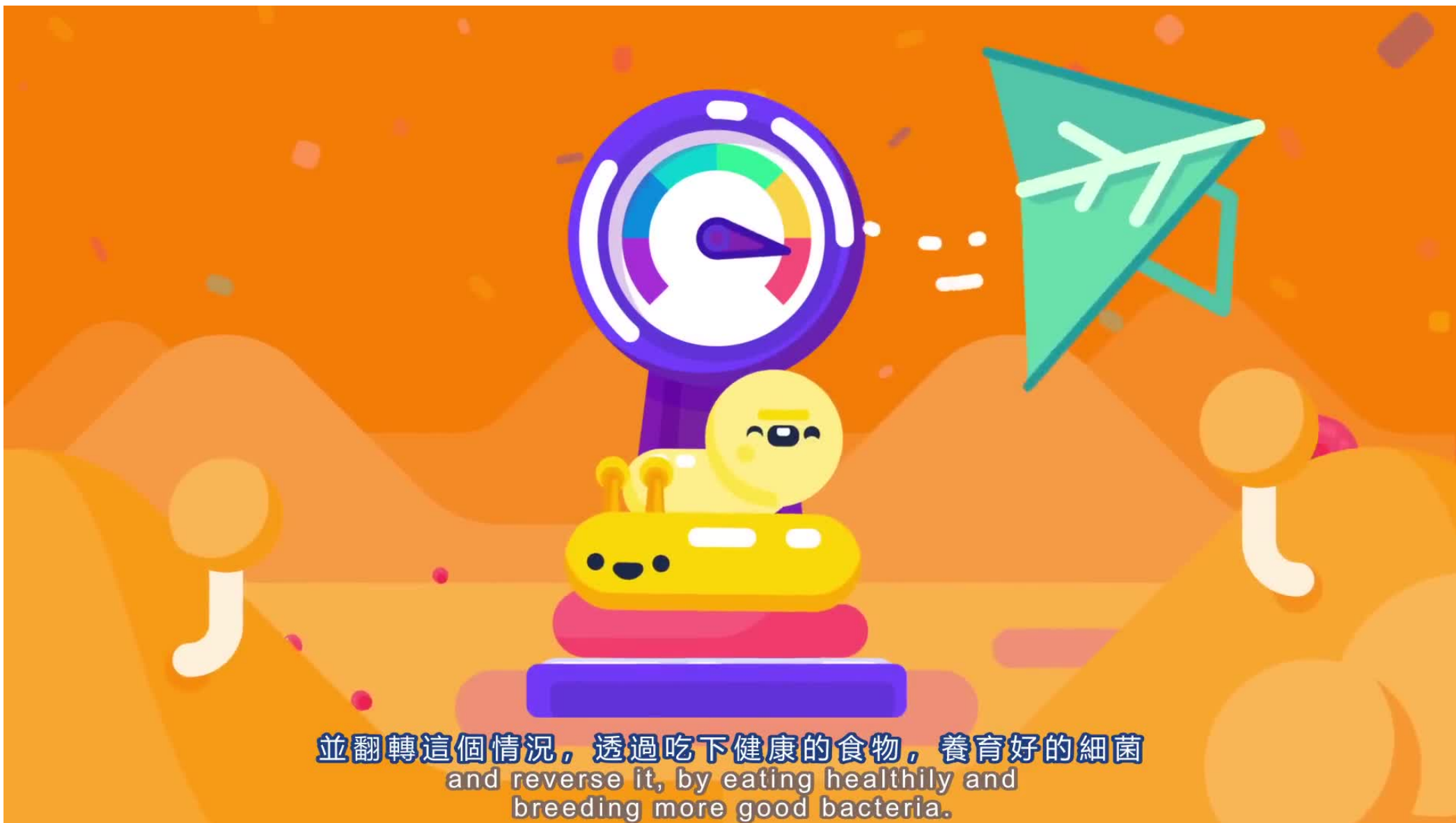


在肥胖中扮演了非常重要的角色

could play a huge role in obesity.



但重要的是，你是可以對抗這個過程
But, it's important to stress that you
can fight this process,

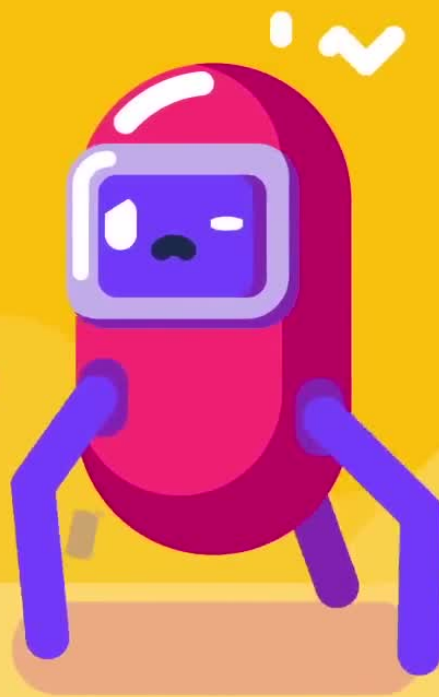


並翻轉這個情況，透過吃下健康的食物，養育好的細菌
and reverse it, by eating healthily and
breeding more good bacteria.



除了增重之外，微生物還被連結到其他嚴重的疾病

Beyond weight gain, our microbiome
has also been linked to other



例如自闭症

serious diseases like autism,

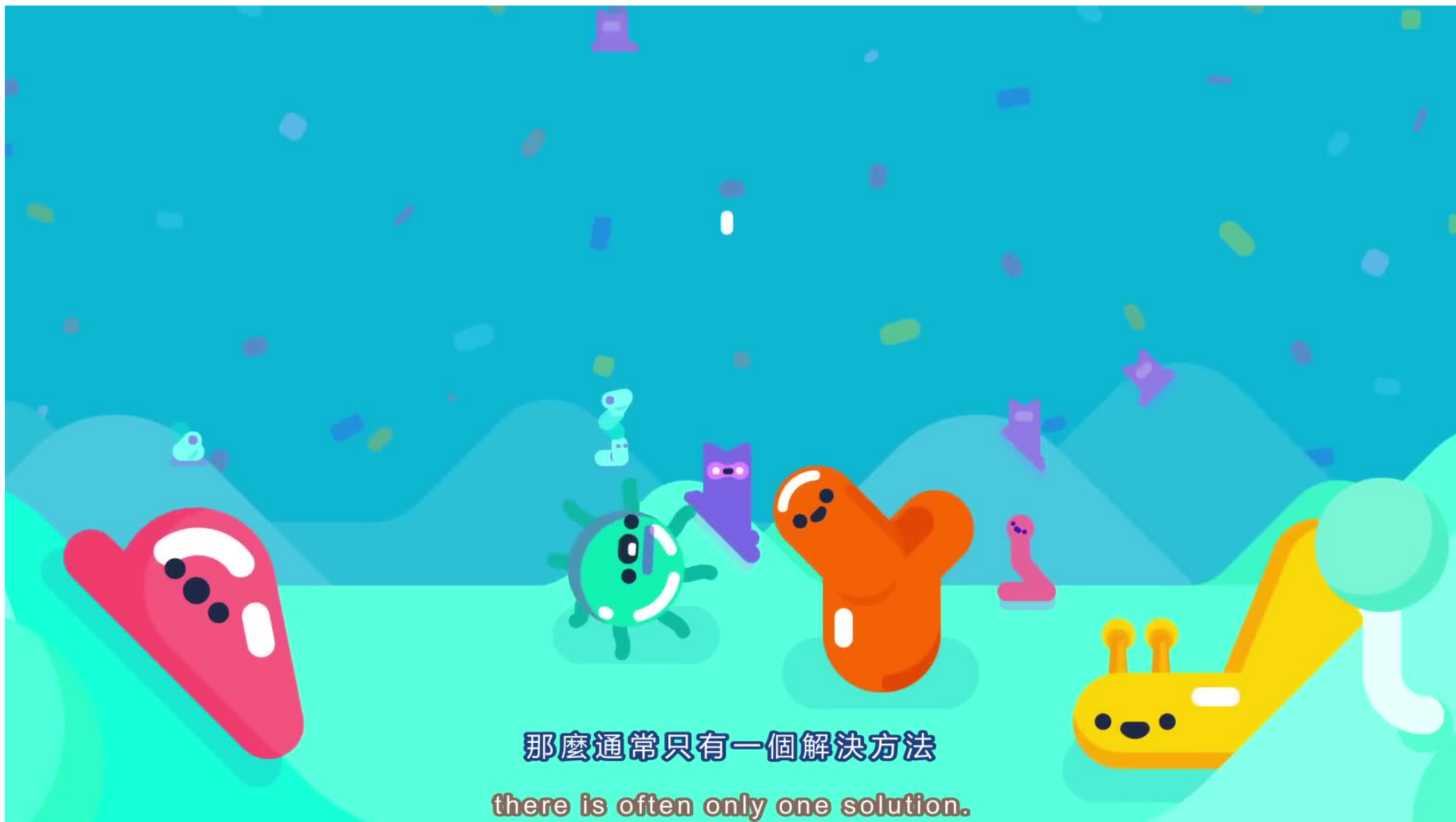


人格分裂以及癌症
schizophrenia, and cancer.

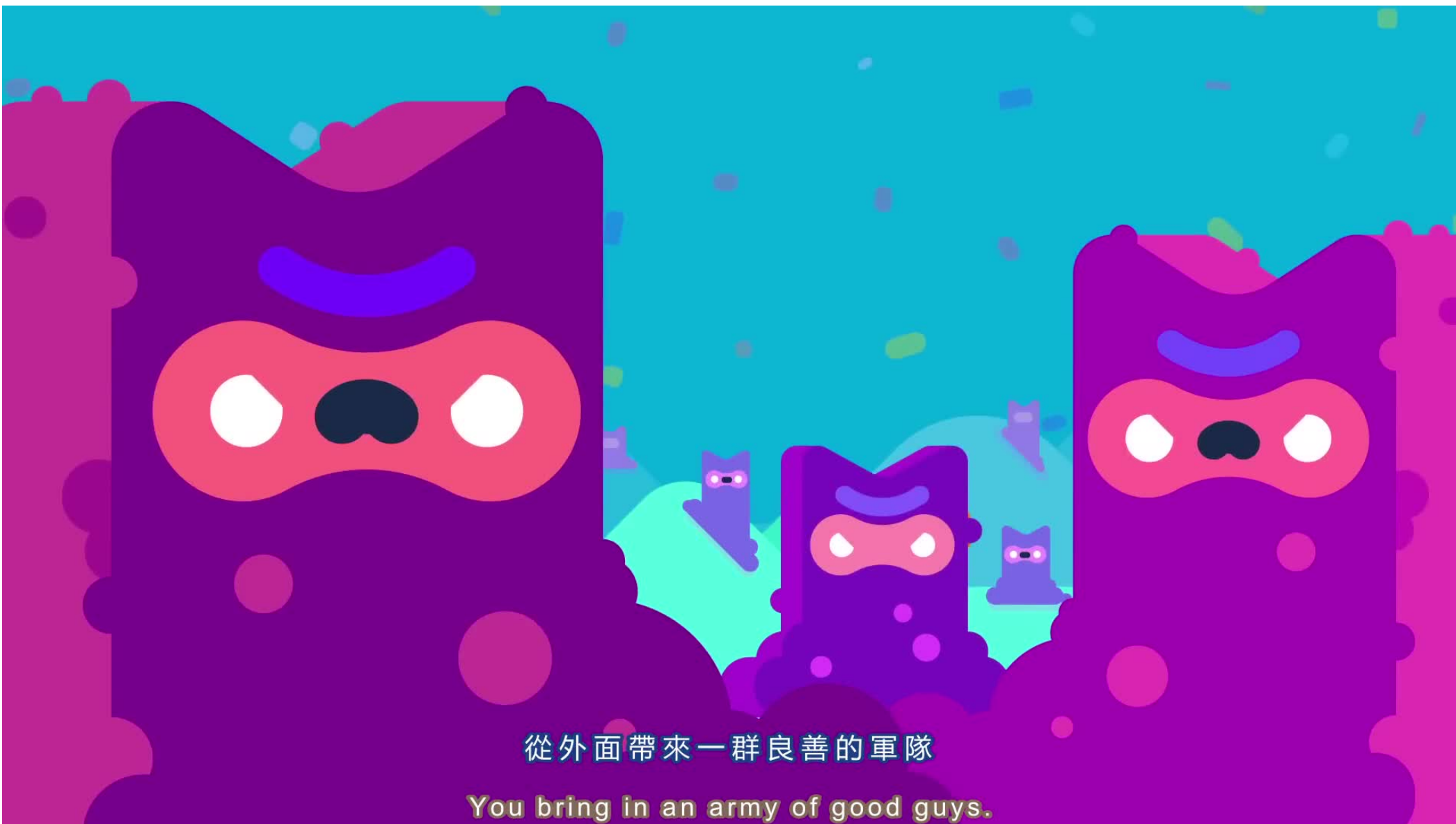




如果腸道中細菌猖獗而傷害你
If your body is overrun with
bacteria that harm you,



那麼通常只有一個解決方法
there is often only one solution.



從外面帶來一群良善的軍隊

You bring in an army of good guys.



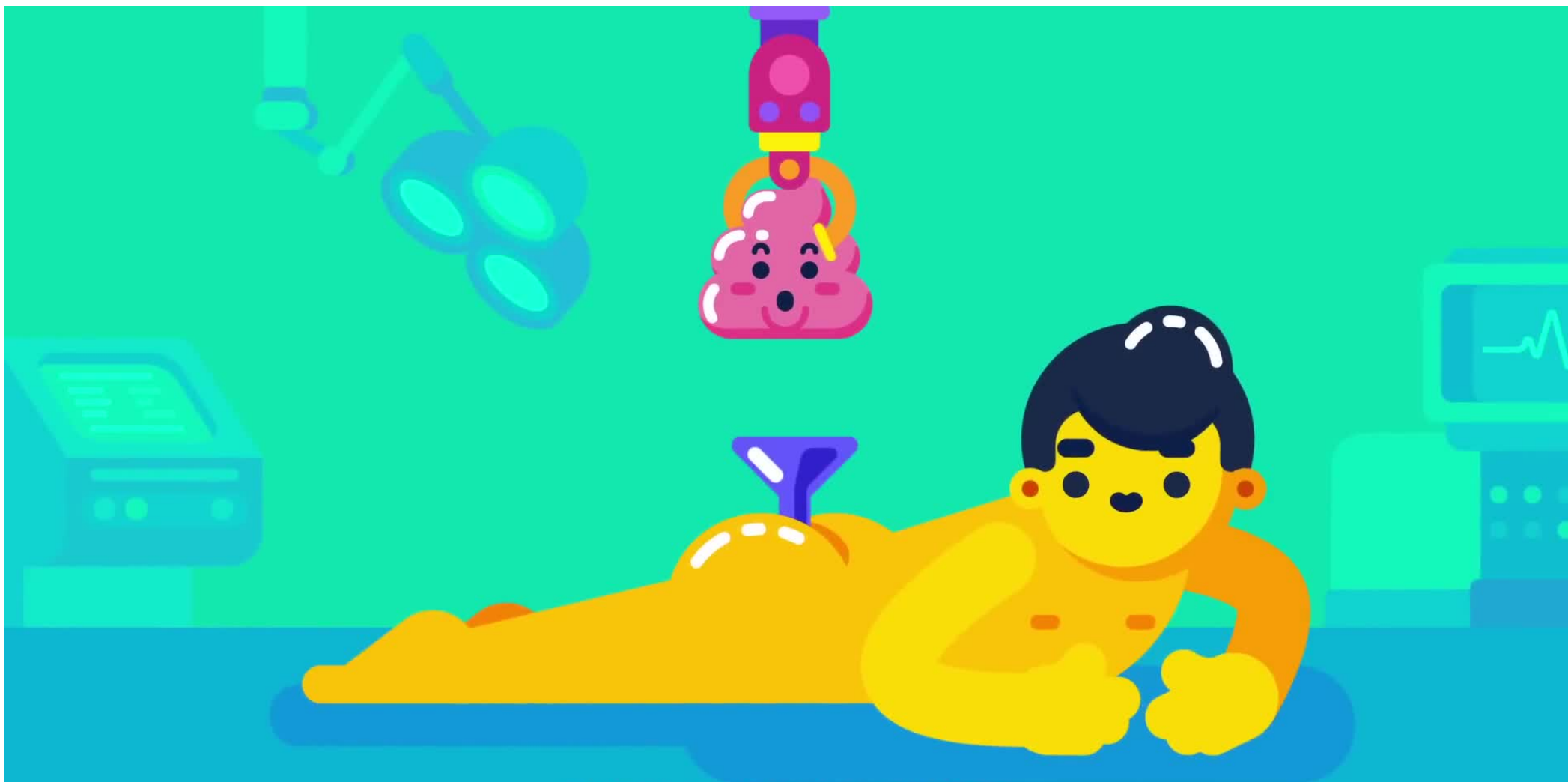
這非常的簡單

That's very easy,

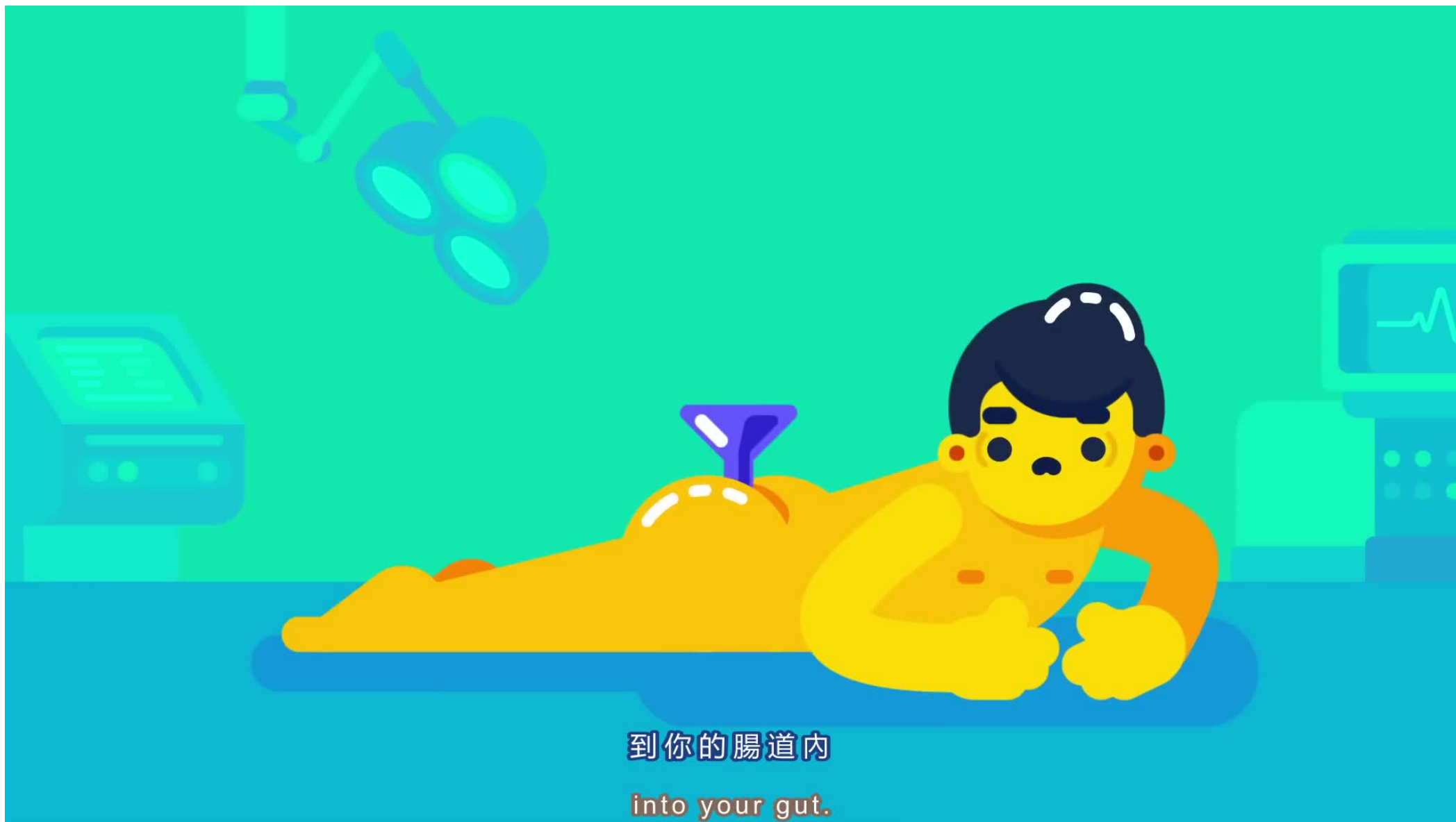


移植某些健康人的粪便

You just transplant some healthy poop.

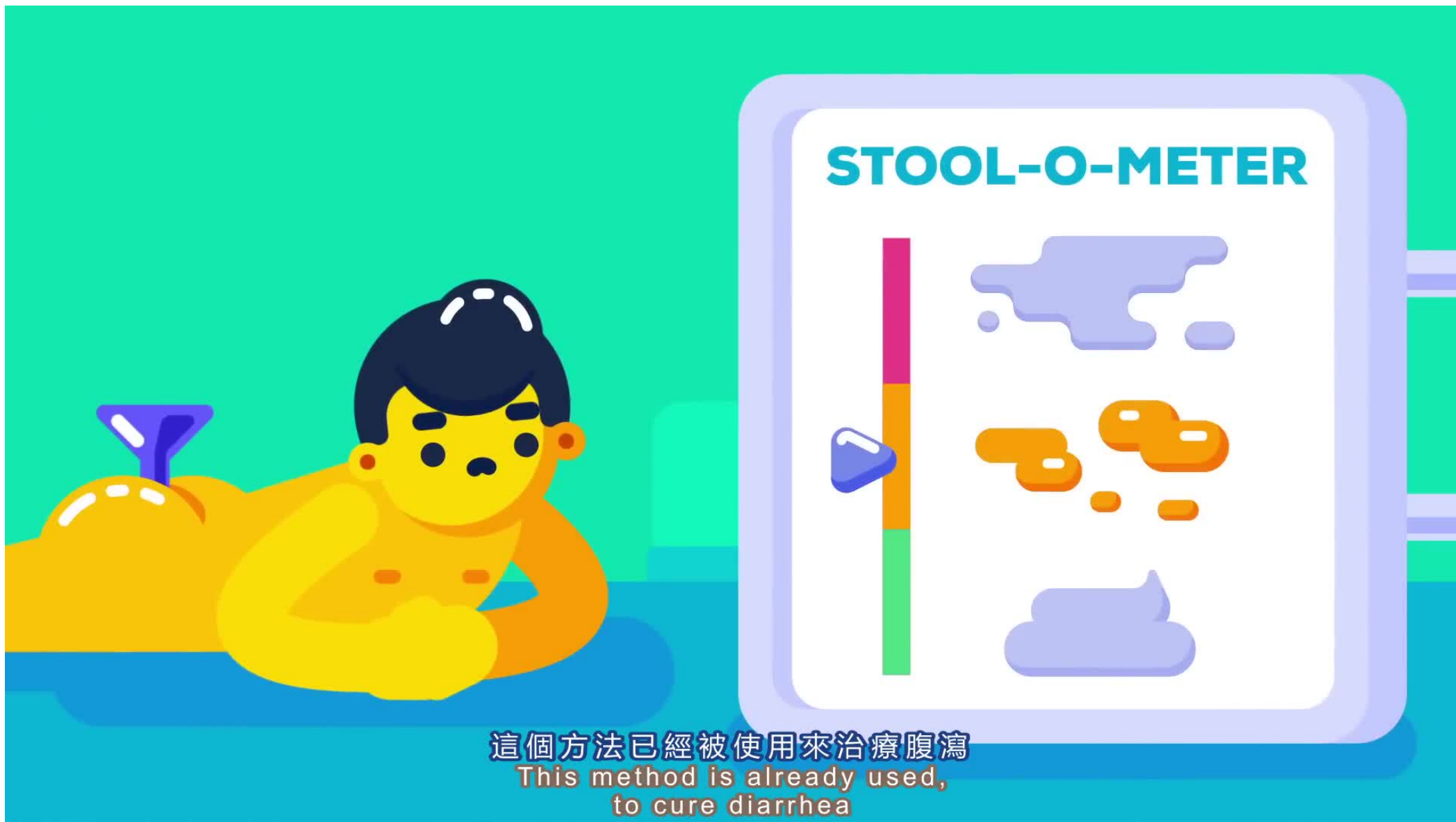


將健康人的糞便確實地移植
You do that by literally transferring poop,
from a healthy person,



到你的腸道內

into your gut.



這個方法已經被使用來治療腹瀉
This method is already used,
to cure diarrhea



是由腸道內艱難梭菌(*C. difficile*)引起的腹瀉
that's caused when *C. difficile* bacteria,
take over a gut microbiome.



但對於其中的交互作用我們仍然瞭解得不夠
But we just don't know enough about
the complex interplay at work here yet.



例如：移植來自過重的人的糞便，治療了該名女性腹瀉
For example, a transplant from an overweight
donor cured a woman's diarrhea,



但卻造成她跟著也肥胖了

but contributed to her obesity down the line.

SCIENCE PROPHECY

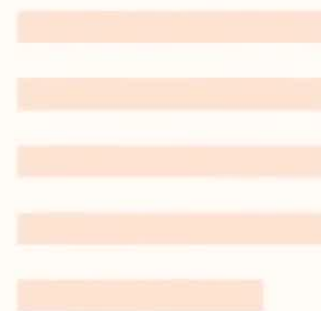
N+1st Year

11 February 2015

500 lbs



Poops, Sorry!



Are Fecundity and Birth of It?

更有其他的研究嘗試想要逆轉這樣的影響

This caused some ways and another
study tried to reverse the effect.



移植來自身材苗條的人的糞便到肥胖的人
Poop transplants from slim people
to obese ones,



Hi!

給予其更多元不同的微生物族群

gave them a more diverse microbiome,



Hi!

並且使其對胰島素敏感度下降

and made them less sensitive to insulin.

The background is a solid dark blue. It is populated with numerous small, semi-transparent, colorful shapes. These shapes include circles, ovals, and irregular blobs in shades of red, orange, yellow, green, cyan, and purple. Some shapes are simple, while others have internal details like smaller circles or lines, giving them a cellular or molecular appearance. They are scattered across the entire frame, creating a dynamic and abstract visual field.

這兩件事情皆發生在接受者體重減輕的例子中
Both things that also happen when
people lose weight



我們需要做更多的科學研究，才能真正地瞭解
We need to do a lot more science,
to really understand



微生物究竟如何讓我們身體健康或生病
how our microbes make us
healthy or sick.



但不論我們是否喜歡

But, whether we like it or not.



我們都需要這些微生物，而他們也需要我們

We need our microbiome, and it needs us.



我們永遠不會只有自己擁有自己的身體

We'll never have our bodies to ourselves.



而是獲得了有力的盟軍

But we have gained a powerful ally,



如果我們能保持和平共處的話
if we can just keep the peace.