BIO NEWS

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1．マウス研究が人間にとってうまくいかない理由

2017 年 7 月 3 日

Scientific Reports 誌に掲載された英国のキングズ・カレッジとスウェーデンのルンド大学の共同研究は、マウス実験でうまく効いている糖尿病薬がなぜ人間には同等にうまく効かないのか、その理由を説明している。
それはインシュリンを生産するベータ細胞の機能における相違にあり、ヒトはマウスが持っているこのベータ細胞上の G タンパク質共役型受容体の大部分が欠けており、さらに注目すべきこととして、受容体の中にはマウスにおいてのみ検出されるもの、ヒトにおいてのみ検出されるものもある。また、別の相違として、GLP-1 受容体が、ヒトのベータ細胞と比較してマウスにおいてより多く生産される、としている。
研究者らは、*The Journal of Clinical Endocrinology and Metabolism* 誌において、以前は知られていなかった受容体、例えば GPR56 が、マウスとヒトの両方から共通に検出されることを示した別の研究も発表している。

英文記事：
https://www.sciencedaily.com/releases/2017/07/170703121018.htm

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Why research on mice may not work on humans: We really are different

Date:

July 3, 2017

Source:

Lund University

Summary:

New research could explain why diabetes drugs which have worked in animal experiments are not equally successful in humans. The researchers discovered differences -- but also unknown similarities - in the function of insulin-producing beta cells.

FULL STORY

Research from King's College in London, UK, and Lund University in Sweden could explain why diabetes drugs which have worked in animal experiments are not equally successful in humans. The researchers discovered differences -- but also unknown similarities -- in the function of insulin-producing beta cells.

The team have mapped a category of receptors, known as G protein-coupled receptors, which control the function of beta-cells. They then compared the presence of these receptors in human cells with their presence in two types of laboratory mice, which have been used for more than 100 years to study human diseases.

"Our results show that there is a big difference between mice and humans, but also that there are differences between the two types of mice," say Dr Stefan Amisten at King's College and Associate Professor Albert Salehi at Lund University.

One of the differences is that humans lack a large part of the G protein-coupled receptors on the insulin-producing beta-cells that mice have and for which many drugs are developed. Of note, some of the receptors were only found in mice and others only in humans.

"This means that a drug developed to stimulate or inhibit a particular receptor which, in mice, can lead to increased insulin production, might have no effect on humans, or even could cause unbeneficial and diabetes-like symptoms," says Stefan Amisten.

Another finding is that the GLP-1 receptor is produced to a greater extent in mouse compared to human beta-cells. The GLP-1 receptor is activated by the GLP-1 hormone, which is released by the intestinal cells when we eat, and which in humans might slightly potentiate insulin secretion while it also markedly delays gastric emptying.

"So the question is whether what we're seeing is merely a beta-cell effect, or also a stomach effect that, in turn, results in a lower food intake and consequently a lower blood sugar," says Albert Salehi.

As the supply of insulin-producing beta-cells from humans is limited to donated cells from deceased organ donors, cells from mice are used in the development of new drugs. The same good results are rarely achieved when testing a new drug on human cells.

"This is well known, and a source of great frustration for researchers and the pharmaceutical industry. Is it then right to continue to develop drugs based on research conducted on mice, when these drugs cannot be used on humans?," asks Albert Salehi.

The study was published in the journal, *Scientific Reports*.

Albert Salehi has also led another study which, on the contrary, has shown that there are new, previously unknown receptors which can be found in both mice and humans. The study published in The Journal of Clinical Endocrinology and Metabolism shows that, for example, GPR56 is a common receptor in both human cells as well as in the insulin-producing cells of the two types of mice, and is linked to improved cell function when activated.

"This opens up the door to new drugs with better potential to work on humans as well," says Albert Salehi.

Story Source:

Materials provided by **Lund University**. *Note: Content may be edited for style and length.*

Journal References:

1. Pontus Dunér, Israa Mohammad Al-Amily, Arvind Soni, Olof Asplund, Fateme Safi, Petter Storm, Leif Groop, Stefan Amisten, Albert Salehi. **Adhesion G Protein-Coupled Receptor G1**

(ADGRG1/GPR56) and Pancreatic β-Cell Function. *The Journal of Clinical Endocrinology & Metabolism*, 2016; 101 (12): 4637 DOI: 10.1210/jc.2016-1884

2. Stefan Amisten, Patricio Atanes, Ross Hawkes, Inmaculada Ruz-Maldonado, Bo Liu, Fariborz Parandeh, Min Zhao, Guo Cai Huang, Albert Salehi, Shanta J. Persaud. **A comparative analysis of human and mouse islet G-protein coupled receptor expression**. *Scientific Reports*, 2017; 7: 46600 DOI: 10.1038/srep46600

目次に戻る

2. 食べ物のにおいを嗅ぐと太る -嗅覚低下マウスは脂肪をより分解して痩せる

2017 年 7 月 5 日

嗅覚は食べ物を楽しむうえで重要であるから、カリフォルニア大学バークレー校による実験で、嗅覚を失った肥満マウスが体重を減らした、という結果はさして驚きではないだろう。しかし、奇妙なことに、この結果は、嗅覚を失ったマウスが、嗅覚を維持したマウスと同量の脂肪分を食べた上でのことである。
今週の *Cell Metabolism* 誌に掲載されたこの新しい研究は、私達が食べる物の臭いが身体がカロリーをどのように対処するかに重要な役割を果たす可能性があることを示唆している。

英文記事：
https://www.sciencedaily.com/releases/2017/07/170705123007.htm

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Smelling your food makes you fat

Mice that lost sense of smell stayed slim on high fat diet, while littermates ballooned in weight

Date:

July 5, 2017

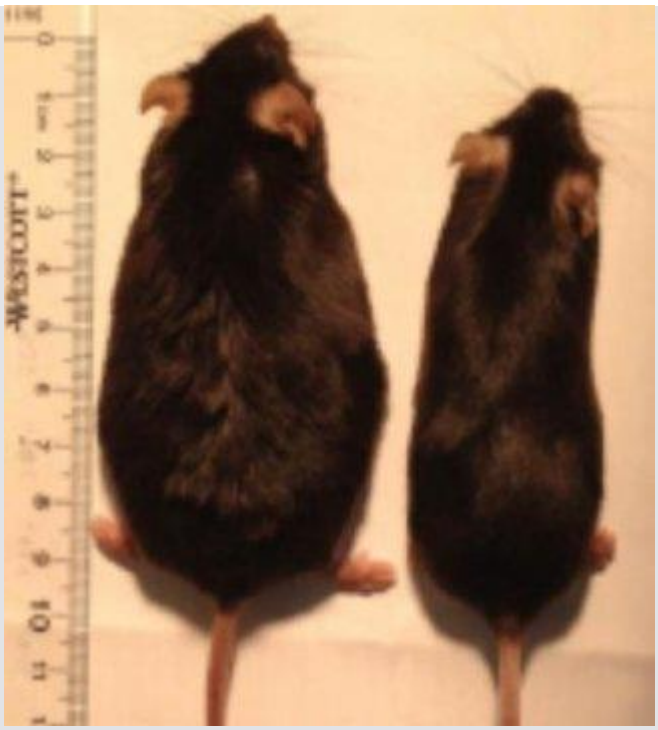
Source:

University of California - Berkeley

Summary:

Researchers developed ways to temporarily eliminate the sense of smell in adult mice, and discovered that those mice that lost smell could eat a high-fat diet and stay a normal weight, while littermates that retained the sense of smell ballooned to twice normal weight. Supersmellers gained more weight than did normal mice on the same high-fat diet. Smell-deficient mice burned excess fat instead of storing it, suggesting a link between smell and metabolism.

FULL STORY



After UC Berkeley researchers temporarily eliminated the sense of smell in the mouse on the right, it remained a normal weight while eating a high-fat diet. The mouse on the left, which retained its sense of smell, ballooned up on the same high-fat diet.

Credit: Céline Riera & Andrew Dillin, UC Berkeley

Our sense of smell is key to the enjoyment of food, so it may be no surprise that in experiments at the University of California, Berkeley, obese mice who lost their sense of smell also lost weight.

What's weird, however, is that these slimmed-down but smell-deficient mice ate the same amount of fatty food as mice that retained their sense of smell and ballooned to twice their normal weight.

In addition, mice with a boosted sense of smell -- super-smellers -- got even fatter on a high-fat diet than did mice with normal smell.

The findings suggest that the odor of what we eat may play an important role in how the body deals with calories. If you can't smell your food, you may burn it rather than store it.

These results point to a key connection between the olfactory or smell system and regions of the brain that regulate metabolism, in particular the hypothalamus, though the neural circuits are still unknown.

"This paper is one of the first studies that really shows if we manipulate olfactory inputs we can actually alter how the brain perceives energy balance, and how the brain regulates energy balance," said Céline Riera, a former UC Berkeley postdoctoral fellow now at Cedars-Sinai Medical Center in Los Angeles.

Humans who lose their sense of smell because of age, injury or diseases such as Parkinson's often become anorexic, but the cause has been unclear because loss of pleasure in eating also leads to depression, which itself can cause loss of appetite.

The new study, published this week in the journal *Cell Metabolism*, implies that the loss of smell itself plays a role, and suggests possible interventions for those who have lost their smell as well as those having trouble losing weight.

"Sensory systems play a role in metabolism. Weight gain isn't purely a measure of the calories taken in; it's also related to how those calories are perceived," said senior author Andrew Dillin, the Thomas and Stacey Siebel Distinguished Chair in Stem Cell Research, professor of molecular and cell biology and Howard Hughes Medical Institute Investigator. "If we can validate this in humans, perhaps we can actually make a drug that doesn't interfere with smell but still blocks that metabolic circuitry. That would be amazing."

Riera noted that mice as well as humans are more sensitive to smells when they are hungry than after they've eaten, so perhaps the lack of smell tricks the body into thinking it has already eaten. While searching for food, the body stores calories in case it's unsuccessful. Once food is secured, the body feels free to burn it.

Zapping olfactory neurons

The researchers used gene therapy to destroy olfactory neurons in the noses of adult mice but spare stem cells, so that the animals lost their sense of smell only temporarily -- for about three weeks -- before the olfactory neurons regrew.

The smell-deficient mice rapidly burned calories by up-regulating their sympathetic nervous system, which is known to increase fat burning. The mice turned their beige fat cells -- the subcutaneous fat storage cells that accumulate around our thighs and midriffs -- into brown fat cells, which burn fatty acids to produce heat. Some turned almost all of their beige fat into brown fat, becoming lean, mean burning machines.

In these mice, white fat cells -- the storage cells that cluster around our internal organs and are associated with poor health outcomes -- also shrank in size.

The obese mice, which had also developed glucose intolerance -- a condition that leads to diabetes -- not only lost weight on a high-fat diet, but regained normal glucose tolerance.

On the negative side, the loss of smell was accompanied by a large increase in levels of the hormone noradrenaline, which is a stress response tied to the sympathetic nervous system. In humans, such a sustained rise in this hormone could lead to a heart attack.

Though it would be a drastic step to eliminate smell in humans wanting to lose weight, Dillin noted, it might be a viable alternative for the morbidly obese contemplating stomach stapling or bariatric surgery, even with the increased noradrenaline.

"For that small group of people, you could wipe out their smell for maybe six months and then let the olfactory neurons grow back, after they've got their metabolic program rewired," Dillin said.

Dillin and Riera developed two different techniques to temporarily block the sense of smell in adult mice. In one, they genetically engineered mice to express a diphtheria receptor in their olfactory neurons, which reach from the nose's odor receptors to the olfactory center in the brain. When diphtheria toxin was sprayed into their nose, the neurons died, rendering the mice smell-deficient until the stem cells regenerated them.

Separately, they also engineered a benign virus to carry the receptor into olfactory cells only via inhalation. Diphtheria toxin again knocked out their sense of smell for about three weeks.

In both cases, the smell-deficient mice ate as much of the high-fat food as did the mice that could still smell. But while the smell-deficient mice gained at most 10 percent more weight, going from 25-30 grams to 33 grams, the normal mice gained about 100 percent of their normal weight, ballooning up to 60 grams. For the former, insulin sensitivity and response to glucose -- both of which are disrupted in metabolic disorders like obesity -- remained normal.

Mice that were already obese lost weight after their smell was knocked out, slimming down to the size of normal mice while still eating a high-fat diet. These mice lost only fat weight, with no effect on muscle, organ or bone mass.

The UC Berkeley researchers then teamed up with colleagues in Germany who have a strain of mice that are supersmellers, with more acute olfactory nerves, and discovered that they gained more weight on a standard diet than did normal mice.

"People with eating disorders sometimes have a hard time controlling how much food they are eating and they have a lot of cravings," Riera said. "We think olfactory neurons are very important for controlling pleasure of food and if we have a way to modulate this pathway, we might be able to block cravings in these people and help them with managing their food intake."

Story Source:

Materials provided by **University of California - Berkeley**. Original written by Robert Sanders. *Note: Content may be edited for style and length.*

Journal Reference:

1. Celine E. Riera, Eva Tsaousidou, Jonathan Halloran, Patricia Follett, Oliver Hahn, Mafalda M.a. Pereira, Linda Engström Ruud, Jens Alber, Kevin Tharp, Courtney M. Anderson, Hella Brönneke, Brigitte Hampel, Carlos Daniel De Magalhaes Filho, Andreas Stahl, Jens C. Brüning, Andrew Dillin. **The Sense of Smell Impacts Metabolic Health and Obesity**. *Cell Metabolism*, 2017 DOI: 10.1016/j.cmet.2017.06.015

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University of California - Berkeley. "Smelling your food makes you fat: Mice that lost sense of smell stayed slim on high fat diet, while littermates ballooned in weight." ScienceDaily. ScienceDaily, 5 July 2017. <www.sciencedaily.com/releases/2017/07/170705123007.htm>.
University of California - Berkeley. (2017, July 5). Smelling your food makes you fat: Mice that lost sense of smell stayed slim on high fat diet, while littermates ballooned in weight. *ScienceDaily*. Retrieved July 11, 2017 from www.sciencedaily.com/releases/2017/07/170705123007.htm
University of California - Berkeley. "Smelling your food makes you fat: Mice that lost sense of smell stayed slim on high fat diet, while littermates ballooned in weight." ScienceDaily. www.sciencedaily.com/releases/2017/07/170705123007.htm (accessed July 11, 2017).

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3. 筋肉グリコーゲンが多過ぎると持久力運動能力を損なう -マウス実験

2017 年 7 月 5 日

2009 年、ウサイン・ボルトは、グリコーゲンと呼ばれる炭水化物のおかげで 100 メートル走世界記録を樹立した。この分子は骨格筋に貯蔵され、短時間の強烈な身体活動に必要な燃料を供給すべく放出される。グリコーゲン生物学の基礎は十分に確立されていると考えられているものの、7 月 5 日に *Cell Metabolism* 誌で発表された IRB バルセロナの研究者らによるげっ歯類の研究が長年にわたる前提を覆している。
この研究によると、グリコーゲン合成はグリコゲニンと呼ばれるたんぱく質を必要とせず、高いグリコーゲンレベルは実際にはマウスの持久力性能を損なうことが示された。

英文記事：
https://www.sciencedaily.com/releases/2017/07/170705123223.htm

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For mice, too much muscle glycogen impairs endurance exercise performance

Date:

July 5, 2017

Source:

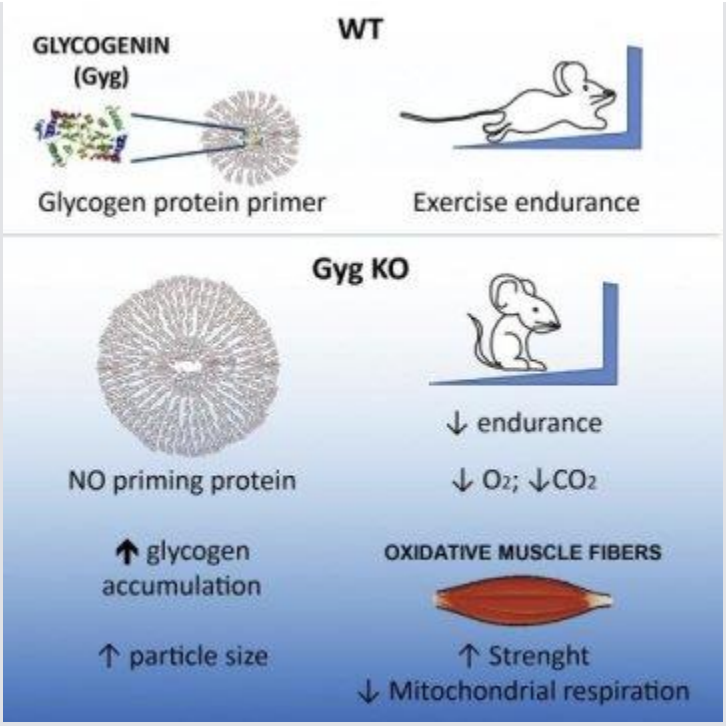
Cell Press

Summary:

The basics of glycogen biology are thought to be well established, but a study in rodents turns long-standing assumptions on their head. Surprisingly, the researchers found that glycogen

synthesis does not require a protein called glycogenin, and that high glycogen levels actually impair endurance muscle performance in mice.

FULL STORY



This visual abstract depicts how although glycogenin is thought to be essential for glycogen synthesis, Testoni et al. show that glycogenin-deficient animals still make glycogen. Surprisingly, glycogen accumulates in striated muscle affecting functionality, including decreased exercise endurance. These findings impact our understanding of glycogen storage disease XV where patients lack glycogenin-1 and accumulate muscle glycogen.

Credit: Testoni et al./Cell Metabolism 2017

In 2009, Usain Bolt set the world record in the 100-meter dash, thanks in large part to a carb called glycogen. This molecule is stored in skeletal muscle and later released to fuel short and intense bouts of physical activity. The basics of glycogen biology are thought to be well established, but a study in rodents

published July 5th in the journal *Cell Metabolism* turns long-standing assumptions on their head. Surprisingly, the researchers found that glycogen synthesis does not require a protein called glycogenin, and that high glycogen levels actually impair endurance muscle performance in mice.

"These findings change our perspective on glycogen synthesis and the role of glycogenin in muscle physiology," says senior author Joan Guinovart (@JJGuinovart) of the Institute for Research in Biomedicine (IRB Barcelona). "From a clinical standpoint, our study also unravels the mechanisms underlying glycogen storage disease XV, a genetic disorder that was recently described in humans for the first time."

In skeletal muscle, fast-twitch glycolytic fibers use glycogen as the main energy source for anaerobic metabolism, serving to sustain brief periods of high-intensity activity. On the other hand, slow-twitch fibers use oxidative metabolism for prolonged low-intensity activity. For decades, scientists have known that muscle glycogen levels are strongly associated with strenuous exercise performance. It is generally accepted that glycogen synthesis requires an enzyme called glycogenin, which catalyzes the formation of a sugar chain consisting of glucose molecules.

The importance of proper glycogen synthesis is illustrated by a fatal neurodegenerative condition called Lafora disease. Due to the build-up of toxic glycogen clumps in neurons and other cell types, patients with this disease commonly experience severe epileptic seizures, motor impairment, muscle spasms, and dementia. Guinovart and his team previously demonstrated that blocking glycogen synthesis by depleting a molecule called glycogen synthase provides a means to effectively treat these patients.

In order to find alternative targets for the disease, Guinovart and first author Giorgia Testoni of IRB Barcelona generated glycogenin-deficient mice, expecting to also block glycogen accumulation in cells. To their surprise, they found high quantities of glycogen in the muscle tissue of these mice. Despite higher glycogen levels, glycogenin-deficient mice underperformed normal mice, reaching exhaustion earlier and covering a shorter distance while running on a treadmill. The mice had a 30% slower running time than usual and covered 50% less distance. The reason for the poor endurance performance of glycogenin-deficient mice was that slow-twitch muscles in the calves started to resemble fast-twitch muscles, switching from oxidative metabolism to glycolytic metabolism.

Contrary to their original expectations, Guinovart and his team did not discover a new treatment option for patients with Lafora disease, because glycogenin deficiency did not prevent glycogen accumulation as they had originally suspected. However, the results may explain the muscular defects of patients with glycogen storage disease XV. As first reported in 2014, patients with this condition show glycogenin depletion in skeletal muscle and muscle weakness, despite high glycogen levels.

"The striking similarities between human patients and the glycogenin-deficient mice we used in our study could open new avenues to understanding the molecular basis of glycogen storage disease XV and developing effective treatments for this newly described disease," Guinovart says.

Story Source:

Materials provided by **Cell Press**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Giorgia Testoni, Jordi Duran, Mar García-Rocha, Francisco Vilaplana, Antonio L. Serrano, David Sebastián, Iliana López-Soldado, Mitchell A. Sullivan, Felipe Slebe, Marta Vilaseca, Pura Muñoz-Cánoves, Joan J. Guinovart. **Lack of Glycogenin Causes Glycogen Accumulation and Muscle Function Impairment**. *Cell Metabolism*, 2017; 26 (1): 256 DOI: 10.1016/j.cmet.2017.06.008

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４．特定のコラーゲンによって皮膚の老化を防止 -マウス実験

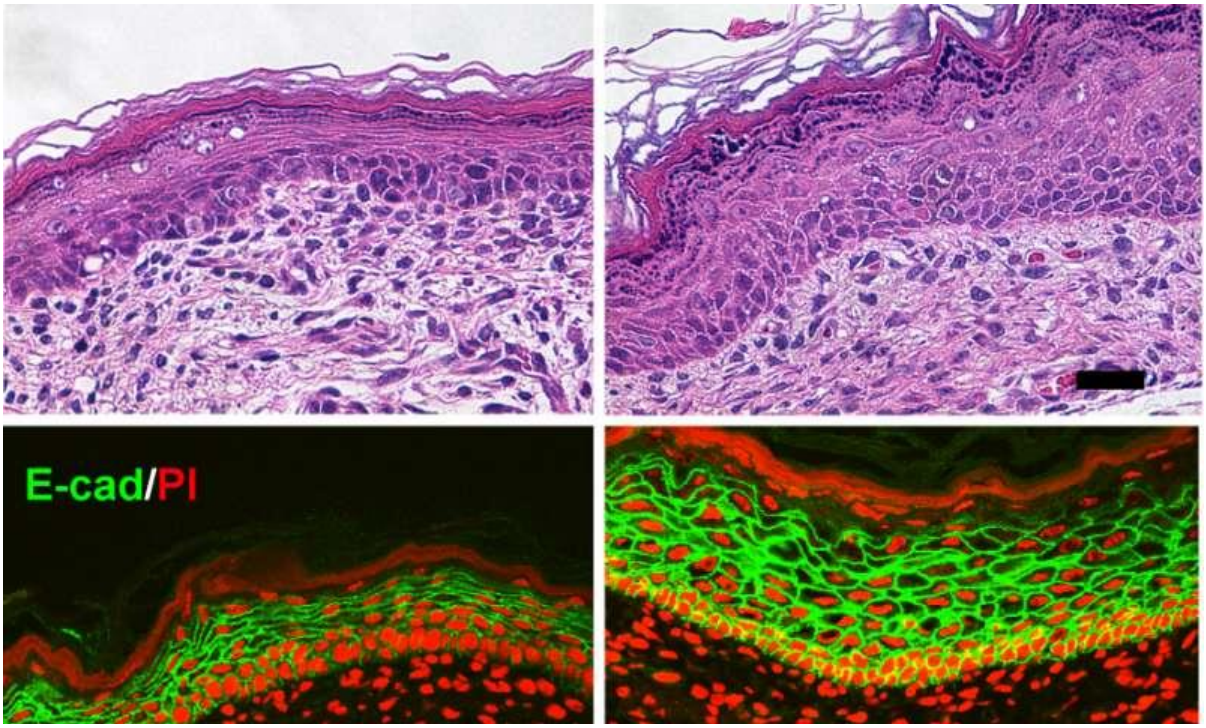
2017 年 7 月 11 日

北海道大学の夏賀健博士と清水宏博士らは、マウスとヒトの皮膚細胞と数理モデルを用いて、表皮の基底層に発現するタイプ XVII コラーゲン（COL17）が毛のない皮膚の表皮細胞の増殖を制御するキー分子となることを同定した。
彼らは *eLife* 誌で発表したマウス実験で、COL17 欠損の新生児マウス（生後 1 日目）は、通常の新生児マウスの皮膚に比べて、表皮の過増殖と皮膚の肥厚が見られること、またヒト COL17 の導入によって、加齢進行が進む中でも、表皮が若年状態を維持されること、などを示した。
彼らは、COL17 が将来の老化防止戦略に使用されうる、としている。

英文記事：
https://medicalxpress.com/news/2017-07-collagen-thickness-juvenile-state-skin.html

Collagen controlling the thickness and juvenile state of skin

July 11, 2017



Neonatal mice (postnatal day 1) lacking COL17 showed epidermal hyper proliferation and thickened skin (right panels) compared to control skins (left panels). Different staining methods are applied in the upper panels and the lower panels.

Scale bar: 20 μm. Credit: Watanabe M., et al. *eLIFE*, July 11, 2017.

Type XVII collagen (COL17) is found to regulate the proliferation of epidermal cells and therefore the thickness of juvenile and aged skin, suggesting COL17 can potentially be used for future anti-aging strategies.

Skin is the body's largest organ and is constantly confronted with a range of external stimuli including microorganisms and physical stress. Epidermis, the outer part of the skin, functions as a barrier to the external environment and works to prevent the loss of water from inside the body. As abnormalities in epidermal thickness can impair the properties of one's skin, the proliferation of epidermal cells is tightly regulated in organismal development and physical aging although most of the underlying mechanisms are unknown.

Using mouse and human skin cells as well as mathematical modelling, Dr. Ken Natsuga and Dr. Hiroshi Shimizu of Hokkaido University and their collaborators identified type XVII collagen (COL17), a protein expressed in the basal layer of the epidermis, as a key molecule that controls epidermal proliferation in non-haired skin.

The team found that COL17 prevents the epidermal cells from over-proliferating and thus preventing the skin from thickening in neonatal mice in coordination with Wnt signaling, which is generally involved in the proliferation of stem cells. In the experiments using mice, they also discovered that physical aging induces epidermal thickening and alters epithelial polarity accompanied by drastic alteration of COL17 distribution in the skin. Introduction of human COL17 helped the epidermis maintain its juvenile state even with the advancement of aging.

"Our findings advance our understanding of how the proliferation of epidermal cells is regulated at different stages of a mammal's life. Although further study is needed to uncover how COL17 expression is regulated, this protein could be a promising component in future anti-aging strategies for skin," says Natsuga.

Explore further: New insights into skin cells could explain why skin doesn't leak

More information: Mika Watanabe et al, Type XVII collagen coordinates proliferation in the interfollicular epidermis, *eLife* (2017). DOI: 10.7554/eLife.26635

Journal reference: eLife

Provided by: Hokkaido University

目次に戻る

5. 細胞温度計の発見 -マウス実験

2017 年 7 月 12 日

Freie Universität Berlin の科学者らは、細胞が遺伝子発現プログラムを非常に小さな温度変化に適応させるメカニズムを同定した。*Molecular Cell* 誌に掲載されたこの研究では、遺伝子発現の変化が、温度計のように温度に従うため、与えられた温度に徐々に適応することができる、としている。
また、この実験はマウスで実施されたが、ヒトにおいてもマウスと同様に体温が日々の時間に依存して変化するため、ヒト生理学においてもこのメカニズムが重要な役割を果たすことが予想される。

英文記事：
https://www.sciencedaily.com/releases/2017/07/170712074459.htm

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Cellular thermometer discovered

Date:

July 12, 2017

Source:

Freie Universitaet Berlin

Summary:

Scientists have identified a mechanism that allows cells to adapt their gene expression program to very small changes in temperature.

FULL STORY

Scientists from Freie Universität Berlin have identified a mechanism that allows cells to adapt their gene expression program to very small changes in temperature. "Like a thermometer, these changes in gene expression follow the temperature in linear form and thus enable gradual adaptation to the given temperature," explains Prof. Dr. Florian Heyd from Freie Universität, who led the study. This cellular thermometer is sensitive enough to react to changes in body temperature between 36 and 38 ° C with altered gene expression. This discovery lays the foundation for a number of other, application-oriented questions. The experiments were carried out in mice, but since there are also time-of-the-day dependent differences in body temperature in humans, it is to be expected that the mechanism also plays an important role in human physiology. The findings were published in the science journal *Molecular Cell*.

"The cells of warm-blooded organisms need a mainly constant temperature and tolerate deviations from the optimal 37 ° C only conditionally," explains Dr. Marco Preußner, who is a postdoctoral researcher and first author of the study. Even a change in temperature of +/- 5 ° C subjects the cell to a heat shock or cold shock, which can lead to cell death after a few hours. For this reason, warm-blooded animals must keep their body temperature relatively constant and prevent the body from adapting to the outside temperature. However, body temperature fluctuates slightly over the day: during the active phase (which for mice is in the dark because they are nocturnal animals), the body temperature is about 1.5 ° C higher than in the resting phase (in mice during the day).

The researchers in the RNA Biochemistry Group at Freie Universität Berlin were able to show that mice use this time-of-the-day-dependent change in body temperature to adapt gene expression to clock-dependent requirements. "This allows a large group of genes to be controlled rhythmically within a period of about 24 hours," Preußner said. The regulation is based on a process known as alternative splicing, through which the building blocks of the messenger RNA (mRNA) can be combined in different ways, which can lead to the formation of several protein variants from a single gene. "The alternative splicing of more than 100 genes reacts extremely sensitively to changes in temperature, so that different proteins are produced depending on the time of day and body temperature," said Prof. Dr. Florian Heyd. In addition, the total amount of a protein can be regulated by alternative splicing, which is illustrated in the current work by using the general transcription factor TBP (TATA-box binding protein) as an example. In this case the temperature-dependent alternative splicing changes a non-coding region of the TBP mRNA, thereby regulating the efficiency with which the TBP protein is synthesized. This

results in a clock-dependent oscillation of the TBP protein, possibly providing an explanation for the differences in the overall transcription rate, which scientists have known about for some time. "The mechanism we demonstrated is the most sensitive cellular thermometer known to date, since the signaling pathways that trigger a heat shock or cold shock hardly react in this physiologically relevant temperature range," explained Prof. Dr. Florian Heyd. On the basis of these findings, more application-oriented questions can now be investigated. Of particular interest is a possible association of temperature-dependent alternative splicing with the immune response during an infection with fever. As sensitive as alternative splicing reacts to (slightly) elevated temperature, a temperature-induced change in gene expression by fever appears to be a logical consequence. In further experiments the researchers plan to investigate the functionality of this mechanism in an infection.

Story Source:

Materials provided by **Freie Universitaet Berlin**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Marco Preußner, Gesine Goldammer, Alexander Neumann, Tom Haltenhof, Pia Rautenstrauch, Michaela Müller-McNicoll, Florian Heyd. **Body Temperature Cycles Control Rhythmic Alternative Splicing in Mammals**. *Molecular Cell*, 2017; DOI: 10.1016/j.molcel.2017.06.006

Cite This Page:

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Freie Universitaet Berlin. "Cellular thermometer discovered." ScienceDaily. ScienceDaily, 12 July 2017. <www.sciencedaily.com/releases/2017/07/170712074459.htm>.

Freie Universitaet Berlin. (2017, July 12). Cellular thermometer discovered. *ScienceDaily*. Retrieved July 13, 2017 from www.sciencedaily.com/releases/2017/07/170712074459.htm
Freie Universitaet Berlin. "Cellular thermometer discovered." ScienceDaily. www.sciencedaily.com/releases/2017/07/170712074459.htm (accessed July 13, 2017).

目次に戻る

6.　抗生物質のナノ粒子が薬剤耐性菌と戦う -マウス実験

2017 年 7 月 13 日

抗生物質耐性は、特にグラム陰性菌に分類される細菌について、益々深刻な問題となりつつある。これらの細菌には 2 つの細胞膜があり、そのため薬物が細胞に浸透して殺すのがより困難なのである。
そこで MIT を始めとする機関の研究者らがこの問題に立ち向かうべく、ナノテクノロジーを用いてこの薬剤耐性細菌を標的とした治療法の開発に取り組んでいる。
この新しい研究において、シリコンのナノ粒子状の抗菌性ペプチドが肺炎を引き起こす可能性のあるグラム陰性菌である緑膿菌に感染したマウスの肺の細菌数を劇的に減少させ、その数は未処置のマウスの約 100 万分の 1 で、更にマウスがより長く生存した、と報告している。また、患者マウスから採取されたペプチドが、研究室で育てた薬剤耐性緑膿菌の菌株を殺す可能性についても示されている。

英文記事：
https://www.sciencedaily.com/releases/2017/07/170713081552.htm

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Antibiotic nanoparticles fight drug-resistant bacteria

Targeted treatment could be used for pneumonia and other bacterial infections

Date:

July 13, 2017

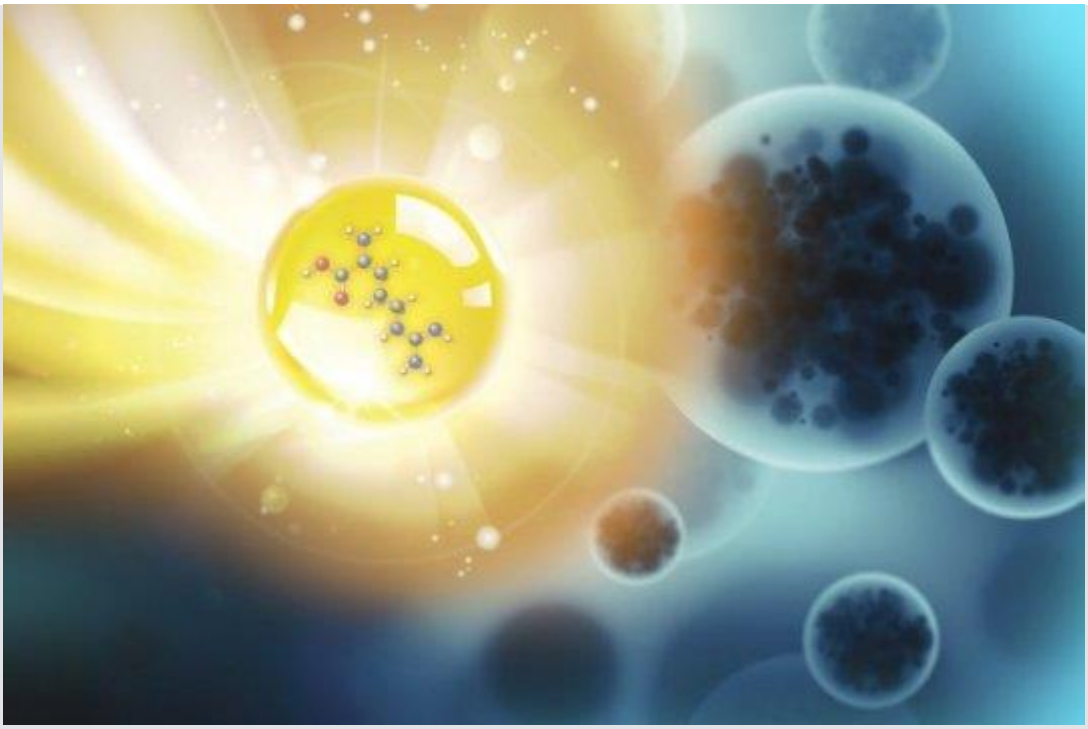
Source:

Massachusetts Institute of Technology

Summary:

Researchers are hoping to use nanotechnology to develop more targeted treatments for drug-resistant bugs.

FULL STORY



Researchers are hoping to use nanotechnology to develop more targeted treatments for drug-resistant bacteria. In this illustration, an antimicrobial peptide is packaged in a silicon nanoparticle to target bacteria in the lung.

Credit: Jose-Luis Olivares/MIT

Antibiotic resistance is a growing problem, especially among a type of bacteria that are classified as "Gram-negative." These bacteria have two cell membranes, making it more difficult for drugs to penetrate and kill the cells.

Researchers from MIT and other institutions are hoping to use nanotechnology to develop more targeted treatments for these drug-resistant bugs. In a new study, they report that an antimicrobial peptide packaged in a silicon nanoparticle dramatically reduced the number of bacteria in the lungs of mice infected with Pseudomonas aeruginosa, a disease causing Gram-negative bacterium that can lead to pneumonia.

This approach, which could also be adapted to target other difficult-to-treat bacterial infections such as tuberculosis, is modeled on a strategy that the researchers have previously used to deliver targeted cancer drugs.

"There are a lot of similarities in the delivery challenges. In infection, as in cancer, the name of the game is selectively killing something, using a drug that has potential side effects," says Sangeeta Bhatia, the John and Dorothy Wilson Professor of Health Sciences and Technology and Electrical Engineering and Computer Science and a member of MIT's Koch Institute for Integrative Cancer Research and Institute for Medical Engineering and Science.

Bhatia is the senior author of the study, which appears in the journal *Advanced Materials*. The lead author is Ester Kwon, a research scientist at the Koch Institute. Other authors are Matthew Skalak, an MIT graduate and former Koch Institute research technician; Alessandro Bertucci, a Marie Curie Postdoctoral Fellow at the University of California at San Diego; Gary Braun, a postdoc at the Sanford Burnham Prebys Medical Discovery Institute; Francesco Ricci, an associate professor at the University of Rome Tor Vergata; Erkki Ruoslahti, a professor at the Sanford Burnham Prebys Medical Discovery Institute; and Michael Sailor, a professor at UCSD.

Synergistic peptides

As bacteria grow increasingly resistant to traditional antibiotics, one alternative that some researchers are exploring is antimicrobial peptides -- naturally occurring defensive proteins that can kill many types of bacteria by disrupting cellular targets such as membranes and proteins or cellular processes such as protein synthesis.

A few years ago, Bhatia and her colleagues began investigating the possibility of delivering antimicrobial peptides in a targeted fashion using nanoparticles. They also decided to try combining an antimicrobial peptide with another peptide that would help the drug cross bacterial membranes. This

concept was built on previous work suggesting that these "tandem peptides" could kill cancer cells effectively.

For the antimicrobial peptide, the researchers chose a synthetic bacterial toxin called KLAKAK. They attached this toxin to a variety of "trafficking peptides," which interact with bacterial membranes. Of 25 tandem peptides tested, the best one turned out to be a combination of KLAKAK and a peptide called lactoferrin, which was 30 times more effective at killing Pseudomonas aeruginosa than the individual peptides were on their own. It also had minimal toxic effects on human cells.

To further minimize potential side effects, the researchers packaged the peptides into silicon nanoparticles, which prevent the peptides from being released too soon and damaging tissue while en route to their targets. For this study, the researchers delivered the particles directly into the trachea, but for human use, they plan to design a version that could be inhaled.

After the nanoparticles were delivered to mice with an aggressive bacterial infection, those mice had about one-millionth the number of bacteria in their lungs as untreated mice, and they survived longer. The researchers also found that the peptides could kill strains of drug-resistant Pseudomonas taken from patients and grown in the lab.

Adapting concepts

Infectious disease is a fairly new area of research for Bhatia's lab, which has spent most of the past 17 years developing nanomaterials to treat cancer. A few years ago, she began working on a project funded by the Defense Advanced Research Projects Agency (DARPA) to develop targeted treatments for infections of the brain, which led to the new lung infection project.

"We've adapted a lot of the same concepts from our cancer work, including boosting local concentration of the cargo and then making the cargo selectively interact with the target, which is now bacteria instead of a tumor," Bhatia says.

She is now working on incorporating another peptide that would help to target antimicrobial peptides to the correct location in the body. A related project involves using trafficking peptides to help existing antibiotics that kill Gram-positive bacteria to cross the double membrane of Gram-negative bacteria, enabling them to kill those bacteria as well.

Story Source:

Materials provided by **Massachusetts Institute of Technology**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Ester J. Kwon, Matthew Skalak, Alessandro Bertucci, Gary Braun, Francesco Ricci, Erkki Ruoslahti, Michael J. Sailor, Sangeeta N. Bhatia. **Porous Silicon Nanoparticle Delivery of Tandem Peptide Anti-Infectives for the Treatment of Pseudomonas aeruginosa Lung Infections**. *Advanced Materials*, 2017; 1701527 DOI: 10.1002/adma.201701527

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Massachusetts Institute of Technology. (2017, July 13). Antibiotic nanoparticles fight drug-resistant bacteria: Targeted treatment could be used for pneumonia and other bacterial infections. *ScienceDaily*. Retrieved July 13, 2017 from www.sciencedaily.com/releases/2017/07/170713081552.htm
Massachusetts Institute of Technology. "Antibiotic nanoparticles fight drug-resistant bacteria: Targeted treatment could be used for pneumonia and other bacterial infections." ScienceDaily. www.sciencedaily.com/releases/2017/07/170713081552.htm (accessed July 13, 2017).

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7. 鬱症状と脳回路の主要リンク -マウス実験

2017 年 7 月 17 日

カリフォルニア大学サンディエゴ校の科学者らは、*Cell* 誌に掲載された研究で、脳の特定の配線を鬱病の症状と関連付けることに成功した、と報告している。
マウス研究で行われた今回の実験では、脳回路が鬱症状である絶望感や無力感と結び付いていることを見つけ、回路改変によってこのような症状を緩和させ逆転までさせた、としている。
抑鬱行動のカギとしては、脳の腹側胸腺領域（基底核の一部）の２つの集団のニューロンが同定されており、鬱病を示すマウスのこれら２つの領域における回路を特異的に改変することにより、健康なマウスの行動様式と同様の改善された行動変化がもたらされることを示している。

英文記事：
https://www.eurekalert.org/pub_releases/2017-07/uoc--nso071417.php

PUBLIC RELEASE: 17-JUL-2017

New study of brain circuits finds key links to symptoms of depression

Altering distinct brain pathways found to aid symptoms such as social withdrawal and helplessness behavior

UNIVERSITY OF CALIFORNIA - SAN DIEGO

University of California San Diego scientists have linked specific wiring in the brain to distinct behavioral symptoms of depression.

In a study published in the journal *Cell*, researchers in UC San Diego's Division of Biological Sciences found brain circuits tied to feelings of despair and helplessness and were able to alleviate and even reverse such symptoms in mice studies.

"We took an approach of studying depression in the sense that different brain areas and circuits of the brain might mediate or contribute to very discrete aspects of depression," said study first-author Daniel Knowland, a UC San Diego graduate student. "For example, brain area A might contribute to loss of appetite, brain area B to social withdrawal and so forth."

Senior author Byungkook Lim, an assistant professor in the Neurobiology Section, said the results require much more study and evaluation to be applied to humans with depression, but the new research in animal models provides solid grounding.

"This is one of the first studies providing clear evidence showing that different brain circuitry is involved in different types of depressive behavior with specific symptoms," said Lim. "Each area of the brain is different with distinct cell types and connectivity, so if we can confirm that one area of circuitry is more involved in a particular symptom than another, we may eventually be able to treat a depression patient more efficiently than treating everyone the same way."

The researchers employed several tools to track brain pathways and specific areas of neurons involved in specific behaviors, including imaging techniques and social strategy behavioral models. Two populations of neurons were identified in the brain's ventral pallidum region (part of the basal ganglia) as key to underlying depressive behavior.

The new study found that specifically modifying pathways in these two areas in a mouse displaying depression led to improved behavioral changes similar to those of a healthy mouse. More importantly, this study provides strong insight to understanding the interaction between several brain areas in depression. Previous studies have mainly focused on the role of certain brain areas in isolation. Researchers in the new study were able to examine connections across multiple regions and how one impacted the other.

###

In addition to Knowland and Lim, coauthors include UC San Diego's Varoth Lilascharoen, Christopher Pham Pacia, Sora Shin and Eric Hou-Jen Wang.

The research was supported by the Klingenstein Foundation, Searle scholar program (Kinship foundation; Searle 15-SSP-229), the Whitehall foundation (2014-08-63), NARSAD young investigator grant (24094) and grants from the National Institutes of Health (MH107742 and MH108594). Lim received a National Institute of Mental Health Biobehavioral Research Award for Innovative New Scientists (BRAINS) in 2015. Lilascharoen is supported by an Anandamahidol Foundation Fellowship.

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8. 「間違った時間」に食べることは体重や周期的リズムに影響する

2017 年 7 月 18 日

テキサス大学 Southwestern Medical Center の研究者らが *Cell Metabolism* 誌で発表したマウスによる研究では、彼らの開発したラボ用の高精度給餌システムによって、摂取するカロリーの量よりも摂取する時間の方が体重減少、ひいては長寿に重要であるという考え方が強まった、としている。
彼らが開発したのは、ハイテクセンサーと自動供給システムを用いた給餌システムで、これによって通常の摂食活動サイクルの間にのみ食べたマウスは、他のグループのマウスと同じ減量カロリー計画にのっとって同じ量を消費したにも関わらず、５つのグループの中で唯一減量に成功したことが分かった、としている。

記事：
https://www.sciencedaily.com/releases/2017/07/170718091542.htm

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Eating at 'wrong time' affects body weight, circadian rhythms

Date:

July 18, 2017

Source:

UT Southwestern Medical Center

Summary:

A new high-precision feeding system for lab mice reinforces the idea that the time of day food is eaten is more critical to weight loss than the amount of calories ingested.

FULL STORY

Besides affecting weight, scientists believe the timing of food consumption affects one's circadian rhythms and may be the route by which dietary habits impact lifespan.

Credit: © tatomm / Fotolia

A new high-precision feeding system for lab mice reinforces the idea that the time of day food is eaten is more critical to weight loss than the amount of calories ingested.

Mice on a reduced calorie plan that ate only during their normal feeding/active cycle were the only ones among five groups to lose weight, despite consuming the same amount as another group fed during their rest time in daylight, according to the study at UT Southwestern Medical Center.

"Translated into human behavior, these studies suggest that dieting will only be effective if calories are consumed during the daytime when we are awake and active. They further suggest that eating at the wrong time at night will not lead to weight loss even when dieting," said Dr. Joseph S. Takahashi, Chairman of Neuroscience at UT Southwestern's Peter O'Donnell Jr. Brain Institute and Investigator with the Howard Hughes Medical Institute.

Using high-tech sensors and automated feeding equipment, scientists developed the feeding system to help answer the difficult question of why calorie-restricted diets improve longevity. They say the new set of tools has already offered fresh insights.

Among the findings published in *Cell Metabolism*, scientists documented how mice on a diet reduced their eating to a very short time period and were unexpectedly active during the day -- the normal rest period for the nocturnal animals. These data reveal previously unknown relationships among feeding, metabolism, and behavior.

"It has been known for decades that caloric restriction prolongs lifespan in animals, but these types of studies are very difficult to conduct because they required manual feeding of subjects over many years. Therefore, shortcuts were taken in order to deal with practical matters such as the normal Monday-to-Friday work week," said Dr. Takahashi, holder of the Loyd B. Sands Distinguished Chair in Neuroscience.

Besides affecting weight, scientists believe the timing of food consumption affects one's circadian rhythms and may be the route by which dietary habits impact lifespan. The study reinforced this notion by testing the day/night cycles of mice under different feeding schedules.

Two groups of mice that were fed at the wrong times during their normal light-dark cycle -- those with a 30 percent calorie reduction and others with unlimited food access during the day -- remained active at night, suggesting they might have chronic sleep deprivation.

This is an especially important factor for scientists to consider for future research, given that many calorie-reduction studies involve only daytime feeding, which is the wrong time for otherwise nocturnal mice. Without accounting for the timing of food intake, research that examines the effects of calorie reduction on lifespan may be skewed by hidden factors such as lack of sleep and desynchronized circadian rhythms.

Dr. Takahashi said the automated system developed for this latest study helped his team address this issue and other confounding variables that have inhibited previous research, including the varied amounts of food given and how quickly it is consumed.

"Despite the importance of these factors, manipulating when and how much food is available for extended periods has been difficult in past research. This automated system, which can be scaled up for large and very long longevity studies, provides the means to address open questions about what mechanisms extend lifespan in mammals, and whether it is actually the calorie reduction or the time at which food is consumed that extends lifespan," Dr. Takahashi said.

Story Source:

Materials provided by **UT Southwestern Medical Center**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Victoria A. Acosta-Rodríguez, Marleen H.M. de Groot, Filipa Rijo-Ferreira, Carla B. Green, Joseph S. Takahashi. **Mice under Caloric Restriction Self-Impose a Temporal Restriction of Food Intake as Revealed by an Automated Feeder System**. *Cell Metabolism*, 2017; 26 (1): 267 DOI: 10.1016/j.cmet.2017.06.007

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UT Southwestern Medical Center. (2017, July 18). Eating at 'wrong time' affects body weight, circadian rhythms. *ScienceDaily*. Retrieved July 18, 2017 from www.sciencedaily.com/releases/2017/07/170718091542.htm
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9. C 型肝炎の新しい動物モデルがワクチンの道を開く

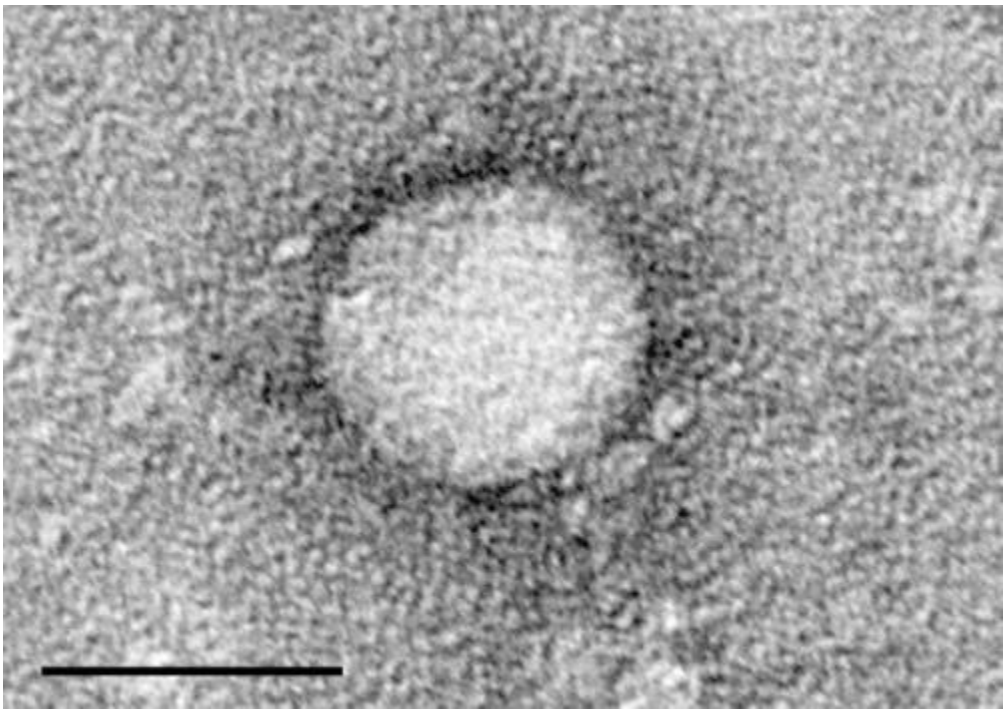
2017 年 7 月 19 日

C 型肝炎は非常に特異的なウィルスであり、ヒトとチンパンジーだけに感染するとされており、このことが新しいワクチンの試験を困難にしている。
しかし、2014 年、コロンビア大学の研究者らにより、ニューヨーク市のラットに C 型肝炎に似たウィルスが発見された。今回ロックフェラー大学との共同研究チームによって、このラットのウィルスをマウスに感染させることに成功、ヒト C 型肝炎の特徴の多くを模倣したヘパシウィルス感染をおこしたマウスモデルの開発に成功した。
Science 誌に掲載されたこの研究で、研究者らは、この新しい動物モデルが C 型肝炎のワクチン研究を加速させる画期的なものになるであろう、としている。

英文記事：
https://medicalxpress.com/news/2017-07-animal-hepatitis-pave-vaccine.html

New animal models for hepatitis C could pave the way for a vaccine

July 19, 2017



Electron micrographs of hepatitis C virus purified from cell culture. Scale bar is 50 nanometers. Credit: Center for the Study of Hepatitis C, The Rockefeller University.

They say that an ounce of prevention is worth a pound of cure. In the case of hepatitis C—a disease that affects nearly 71 million people worldwide, causing cirrhosis and liver cancer if left untreated—it might be worth even more.

The reason is that the disease shows no outward signs, and more than 80 percent of sufferers go undiagnosed. So while an effective cure does exist, what's most needed is a vaccine that can prevent infection in the first place.

Charlie Rice, the Maurice R. and Corinne P. Greenberg Professor in Virology at The Rockefeller University, has been working for decades to develop just that; in fact, his previous research lead to the development of the cure for hepatitis C infection that first became available in 2015. But his research, and the field in general, have been

stymied by a lack of animal models that can be used to study the interaction between the disease and the immune system.

Now, Rice and his colleagues have uncovered a method to mimic the disease in rodents. In work published in *Science*, the team of researchers describes how they discovered a virus that is closely related to hepatitis C, but is able to infect rats and mice. The researchers found that this new animal model recapitulates much of the human disease, a breakthrough that should accelerate hepatitis C vaccine research.

A breakthrough from the streets of New York

Researchers around the world rely heavily on animal models to study human disease. "We need to use animals to watch the disease develop over time and monitor how the immune system responds," explains Eva Billerbeck, a research associate in the Rice lab and lead author on the new research. "This hasn't been feasible for the hepatitis C virus, which has made our work very difficult."

The problem is that hepatitis C is a highly specific virus, infecting only humans and chimpanzees. This means that researchers must rely on blood samples and liver biopsies from infected patients to study the disease. These limited and infrequent samples provide only partial information about how the disease progresses and make it difficult to test new vaccines.

In 2014, however, there was an unexpected breakthrough. While studying the pathogens that infect common rats on the streets of New York City, Ian Lipkin, a professor at Columbia University, discovered a rodent hepacivirus that belongs to the same family of viruses as hepatitis C. Lipkin and his colleague Amit Kapoor quickly shared the virus with the Rice lab, hoping that it would enable them to create a rodent version of the disease.

Mouse models for acute and chronic hepatitis C

Mice are the preferred animal model for much of modern biological research, with a host of genetic tools and techniques that make mechanistic studies possible. Rice and his team, including researchers in Copenhagen, led by Troels K. H. Scheel and Jens Bukh,

set out to explore whether the rat virus could also infect mice. They isolated the hepacivirus from rats and exposed standard laboratory mice to the disease. The experiment worked: the mice developed a hepacivirus infection that mimicked many of the features of human hepatitis C.

There was one notable difference, however. "In human patients, hepatitis C virus infection has two outcomes," Billerbeck explains. "Initially, it is acute, and a small percentage of patients fully recover from infection. However, most people progress to a chronic form of the disease that will continue to affect them unless they are treated." Rice and his team found that mice with a healthy immune system experience the acute form of the disease and then recover, while immune-compromised animals become chronically infected and remain so even after their immune systems are restored.

The researchers are now using their new animal models to gain insight into how hepatitis C infection progresses, and to understand how the body reacts. "This research will help unravel mechanisms of liver infection, virus clearance, and disease mechanisms," Rice says, " which should prove valuable as we work to develop and test hepatitis C vaccines that can help to finally eradicate the disease around the world."

Explore further: New hepatitis C treatments more effective, tolerable: FDA

More information: Mouse models of acute and chronic hepacivirus infection, *Science* 14 Jul 2017: Vol. 357, Issue 6347, pp. 204-208, DOI: 10.1126/science.aal1962 , http://science.sciencemag.org/content/357/6347/204

Journal reference: Science

Provided by: Rockefeller University

目次に戻る

10. 慢性疾患研究にブタモデル使用で、薬剤失敗率を最小限に抑えることができるかもしれない

2017 年 7 月 20 日

Penn State 大学を始めとする国際研究チームの科学者らによると、大腸癌や 2 型糖尿病など、高カロリー食に関連する疾患研究に対しては、マウスモデルよりもブタモデルを使用する方が、薬剤失敗率を低くできる可能性がある、としている。
米国癌研究協会が発表した *Cancer Prevention Research* 誌に掲載された研究結果で示されたその理由は、マウスモデルは特定の条件下では引き続き研究に重要だとしながらも、ブタがヒトと似た微生物プロファイルと免疫システムを有していること、またヒトと同様に 2 つの異なる結腸幹細胞集団 ASCL-2 と BMI-1 を保持していること（マウスは結腸癌に重要な役割を果たす BMI-1 幹細胞を欠いている）、だと示している。

英文記事：
https://www.sciencedaily.com/releases/2017/07/170720113645.htm

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Using a pig model to study chronic diseases may help minimize drug failure rate

Date:

July 20, 2017

Source:

Penn State

Summary:

Scientists may be able to minimize the failure rate of drugs for diseases linked to high-calorie diets, such as colon cancer and type 2 diabetes, if they test treatments using a pig model, according to an international team of researchers.

FULL STORY

Pigs and humans have similar colonic stem cell populations and microbiomes, according to Jairam K.P. Vanamala, who led a research effort to better understand those similarities. Using a pig model may help other scientists more effectively test treatments for colon cancer, type 2 diabetes and other chronic diseases.

Credit: Patrick Mansell

Scientists may be able to minimize the failure rate of drugs for diseases linked to high-calorie diets, such as colon cancer and type 2 diabetes, if they test treatments using a pig model, according to an international team of researchers.

In a study, researchers found that pigs, which have gut bacterial profiles and immune systems similar to humans, also maintain two distinct colonic stem cell populations -- ASCL-2 and BMI-1. Mice lack colonic BMI-1 stem cells that play a critical role in how colon cancer forms -- or carcinogenesis -- and how material passes through the cell lining of the intestinal wall -- or gut permeability.

"Seven out of ten deaths in the United States are due to chronic conditions," said Jairam K.P. Vanamala, associate professor of food sciences, Penn State. "And, yet, we have a high failure rate for drugs and treatments in studies looking to alleviate those conditions. Treatments that work in mice, do not always work well in humans. We show that a pig model may be an alternative that can help lead to better treatments and food-based prevention and therapeutic strategies."

The researchers, who released their findings in *Cancer Prevention Research* Journal, published by the American Association of Cancer Research, used a visualization technique -- immunofluorescence -- to identify stem cells in the colon of pigs that were fed either a high calorie diet or a standard diet. They observed two types of stem cells -- ASCL-2 positive and BMI-1 positive -- in the pig colon, similar to the human system.

"Mice models will continue to be important to study under certain conditions," said Vanamala, who is also a faculty member at the Penn State Hershey Cancer Institute. "But, what we found is that the pig model has both a microbiome that is closer to the human microbiome and the intestinal physiology is, also, similar to humans."

The gut microbiome refers to the 30-50 trillion or so bacteria that dwell in the gut.

According to the researchers, stem cells, which can generate all types of intestinal cells, are typically located deep within tube-like crevices -- called crypts. However, when cells at the ends of the crypt are damaged, stem cells move up the crypt to help repair the damage. In pigs that consumed a high calorie diet, the researchers found that the stem cells moved out of the protected base of the crypt and potentially exposed themselves to similar damage.

In the case of pigs and humans, when cells are damaged, most likely only BMI-1 stem cells are activated and move up the crypt, say the researchers.

"So, if we are studying colon crypts and looking at, for example, how cancer develops in mice, we are only taking one type of stem cells into the equation, not the interplay of both ASCL-2 and BMI-1," said

Vanamala. "We need to see how these stem cells are both working together to heal, or how they are damaged that leads to the development of colon cancer."

Vanamala suggests that BMI-1 stem cells may become cancerous if exposed while moving up the crypt to heal cells and are damaged by inflammation and toxins produced by eating a high-calorie diet.

"A high calorie diet means you may not be taking in a lot of fiber, which is an important food for the gut bacteria, and these gut bacteria devoid of any fiber may start eating away at the mucous and also start producing toxins, which causes inflammation to set in," said Vanamala. "The stem cells that are working to repair this damage, then, are starting to move up the crypt toward the lumen where they may get exposed to toxins. Once they get damaged, the stem cell -- because it lives a long time -- can potentially become cancerous."

Vanamala added that one of the advantages of having human-relevant and agriculturally important animals model is that research at the intersection of agricultural and medical research can be strengthened to develop safe, affordable and evidence-based food approaches to counter the global epidemic of chronic diseases. As an example, he cited his previous research on baked purple potatoes that have compounds that help suppress chronic intestinal inflammation elevated from a high-calorie diet and stem cell proliferation, which are linked to both colitis and colon cancer.

For the current study, the researchers fed eight pigs a high-calorie diet, which has 23 percent fat, and fed the control group of eight pigs a standard diet with 5 percent fat during a 13-week period.

Story Source:

Materials provided by **Penn State**. *Note: Content may be edited for style and length.*

Journal Reference:

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