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MESSAGE FROM NEIL B. GODICK

Beer - Russia's President Dmitry Medvedev recently signed legislation that defines beer as an alcoholic beverage. This is a first in Russia. The law limits where and when beer can be sold.

Russian public health advocates and family groups have long complained about lax legislation that classified beer as a foodstuff. That enables it to be sold like a soft drink, even from street kiosks, and consumed openly in any public place.

People visiting Russia for the first time frequently comment on seeing people, including teenagers, swigging on bottles of beer while walking down the street, sitting in the bus or riding the metro.

With the legislation, effective January 1, 2013, only licensed shops will be able to sell beer between 8AM and 11 pm. Public transport stops, gas stations, airports, and kiosks, which account for about a third of all beer sales in Russia, will not be able to sell the beverage at all.

Since coming into office, a little more than three years ago, President Medvedev has introduced a series of steps to reduce Russia's alcohol consumption.

According to official sources, the average Russian drinks about five gallons of pure alcohol each year. This is twice the amount the World Health Organization describes as the "danger level."

A 2009 study in the medical journal the Lancet estimated that alcohol abuse accounted for 600,000 deaths annually in Russia and fully half of all deaths of men between the ages of 15 and 54.
The alternative – For yet another reason, beer and vodka consumption in Russia is in danger of declining. Many of the country's younger generation (15 to 35 year olds) snub tradition in favor of a cup of coffee.

Demand for coffee in the country could double in the next three years amid spiraling consumption from the country's forward-thinking younger consumers. This younger generation in Russia has helped

demand increase by over 10% during the past few years.

"Compared with other parts of Europe, Russia still doesn't drink a lot of coffee. Per capita consumption is around 1.5kg. But in the next three or four years Russia can easily double this number.

This younger generation sees coffee as a really good product. If you don't drink too much of it, it's healthy. They believe that coffee can change Russian culture. Coffee is seen as a symbol of enthusiasm, freedom and democracy.

We do not intend for the following reports to solve any need our readers may have. We do intend to keep everyone current on technology developments in Russia. If you would like any additional information on any of the developments reported – send us a note.

Russian scientists develop drugs to treat Alzheimer disease

The search for new methods to treat neurodegenerative diseases is a priority biomedical research area. Statistical data indicate a growing neurodegenerative disease incidence rate amongst the world's population. WHO analysts predict that the number of Alzheimer's disease patients (at least 26 million today) may quadruple by 2050. Most neurodegenerative diseases develop as a result of nerve cells' death. Many neurodegenerative pathologies are connected with poisonous agents' accumulating within or near the cell. In case of Alzheimer's disease, near neurons, amyloid protein aggregates, are formed that damage them.

The **RAS Institute of Bioorganic Chemistry (Pushchino)** studies molecular mechanisms that cause this disease, looks for agents that can stop nerve cells' destruction and prevent protein aggregates' formation. These agents will then be used as a base for effective drugs.

While studying a short fragment (containing 6 amino acids named dubbed HLDF-6), Pushchino researchers discovered that it determines the protein's entire functional activity. It promotes memory improvement and has neuroprotector action. Using experimental models (Alzheimer' disease, Parkinson's disease, drug addiction, ischemic stroke); the scientists demonstrated that this preparation positively affects long-term memory formation and retention. Experiments on neurons unambiguously indicated that HLDF-6 has neuroprotective effect.

It was this therapeutic peptide's action mechanism that attracted the researchers' attention. They demonstrated that these effects were achieved by activating biosynthesis and steroid hormone metabolism enzyme genes. Large-scale studies in this field are now in progress at the laboratory to learn more definitely how HLDF-6 peptide operates. A Russian patent has been obtained for HLDF-6. Its preclinical trials have started in accordance with the international

GLP norms. To date, studies have been completed on the peptide's acute and sub chronic toxicity.
#2011-08-178

Russian scientists develop GM tobacco

Root bacteria entering into symbiosis with plants enhance their mineral nutrition and offer protection against plant pathogens. Legumes that are rich in protein from their symbiosis with rhizobia - root nodule nitrogen-fixing bacteria are examples. Not all plants naturally interact with microorganisms. However, this capability can be imparted to them. Specialists from the **RAS Ufa Research Center Institute of Biochemistry and Genetic (Ufa)** are developing artificial symbioses.

The researchers selected two plants that never enter into symbiosis in the nature. One is the tobacco plant (*Nicotiana tabaccum*) – a classical model plant for genetic manipulations. The other is rape (*Brassica napus*) – a very valuable and promising agricultural plant. The scientists introduced the pea gene that encodes lectin. This ensures the plants' interaction with root nodule bacteria into tobacco leaf pieces and rape germs. After transformation, the leaves' edges and germs get covered with *bearded roots* (thin branched rootlets). These roots were treated with rhizobia – symbiotic pea bacteria. Rhizobia are known to settle on root fibrils because lectin is bonded with both bacteria and root cells. In their experiments the Ufa researchers found that the rhizobia populations on the tobacco and rape lectin-containing root surfaces were respectively 14 and 37 times larger than in the control plants that were administered the lectin gene.
The researchers are confident that using legume lectins as transgenes will help form stable associations of economically valuable non-symbiotrophic plants with rhizobia.
#2011-08-179

Russian scientists study impulsive rats

Impulsiveness is a behavioral feature characterized by hasty, inopportune, and risky acts. It is often peculiar to patients with various manias, antisocial behavior or hyperactivity. It is also predisposed to people with drug or alcohol addiction. To study these diseases' nature, working with animals that differ in manifesting this quality makes sense. Specialists from the **RAS Institute of Higher Nervous Activity and Neurophysiology (Moscow)** decided to determine the connection between impulsiveness and behavioral traits by experimenting on rats.

Animals that were earlier trained to press a pedal to obtain tasty morsels were given a choice: either a small morsel immediately or four morsels, but with some delay. Rats in more than 60% of cases chose the meager but immediate reward. These rats were classified as impulsive. Those that preferred waiting for a bigger meal were classified as self-controlled.

After the tests the researchers concluded that impulsive animals can more easily adapt themselves. They also have a higher investigative activity and lower anxiety than self-controlled rats. Activity, curiosity and fearlessness are excellent qualities but, according to the scientists, they make impulsive rats take unnecessary risks. Impulsive animals like their wishes fulfilled immediately – they do not expect to be fed later. Self-controlled rats find it more difficult to adapt themselves to changes in the environment. At the same time their self-preservation instinct is stronger and they can suppress immediate reactions for the sake of a more reliable future result (be it life preservation or a larger tasty morsel).
#2011-08-180

Kurchatov Institute researchers enhance the superconducting magnet reliability

Superconducting magnets (SM) are now used in industry. Their best application example is magnetic resonance tomography (MRT). **Kurchatov Institute** researchers are working to expand superconducting magnets' capabilities and applications.

Modern composite superconductors' design is quite sophisticated, often comprising several thousand (or sometimes tens of thousands) thin superconducting fibers within a copper matrix. Any increase in the superconductor temperature when exposed even to an insignificant heat pulse is determined by the composite's thermal capacity. At helium temperatures (4–6 K), the typical structural materials' thermal capacity values are extremely low. Therefore even an insignificant heat release may be enough to heat the superconductor above its critical temperature. This is accompanied by SM's uncontrollable transition to its normal state and sometimes even by its partial destruction. Something like that happened to the Large Hadron Collider stopping its operation for some time.

A way to solve this problem and increase SM reliability is to add agents with high heat capacity to the superconducting material. Introducing additives with extremely high heat capacity at low temperatures into the SM composition makes it possible to increase the total heat capacity around the superconductor. This creates a heat buffer. With the appropriate additive, to convert the superconductor to its normal state would require 2–3 times more heat than is available in an ordinary magnet.

Electronic systems based on rare-earth metals have anomalous properties. For example, during cooling they can either expand or contract. In some, magnetic moments, instead of becoming ordered at reduced temperatures, they may disappear. In the helium temperature region, due to strong electronic correlations, they make a very sizable contribution to the heat capacity. Realizing this Kurchatov scientists used this effect to stabilize superconducting magnetic systems. Comprehensive studies and laboratory tests at Kurchatov demonstrated this method's advantages. A technology was developed to produce superconductor prototypes with internal doping. Typically

the prototypes are several hundred meters long.
#2011-08-181

The suicide gene in stem cells

The **Laboratory of Molecular Stem Cell Biology at the RAS Institute of Cytology (Saint-Petersburg)** cultivates pluripotent stem cells. The research focuses on these stem cells because they have potential to treat a wide spectrum of human degenerative diseases that require tissue substitution therapy. These cells have two unique features: they can differentiate into all known body cell types and can be unrestrictedly reproduced in culture *in vitro* while retaining their properties.

Induced pluripotent stem cells (iPSC) produced in the laboratory grow on specially treated plastic as dense accumulations containing several dozen cells.

A serious problem that must be overcome before using pluripotent cells in clinical practice is related to their capability to form teratomas. These are fast growing tumors containing various differentiated cell types. It was shown that subcutaneous introduction of just two embryonic stem cells (ESC) to mice causes teratoma formation and, in the final analysis, their death. On the other hand, the existing directed ESC and iPSC differentiation methods enable obtaining very inhomogeneous populations. The populations almost always contain residual non-differentiated ESC and iPSC that can trigger teratoma formation. Pluripotent cells' application in clinical practice can never be safe if there is the slightest chance of their residual presence in suspensions administered to patients.

The laboratory researchers developed a method to solve this problem. It involves introducing a stable suicide gene into the ESC or iPSC genome. The genetic construction is such that this gene becomes active only if the cell is non-differentiated (teratogenic). As it becomes differentiated (safe), the suicide gene's activity sharply falls. Successfully tested on mice, this method for protecting recipients against teratomas during tissue substitution therapy based on pluripotent cells has been patented.

By integrating the suicide gene (like any other foreign DNA), the host genes' functioning could be disturbed. This may include genes that protect the cell from cancerous degeneration. This probability is extremely low but nevertheless does exist, while consequences could be disastrous. There is also the probability of the suicide gene's (like any other foreign DNA's) uncontrollable activity reduction. As soon as it happens, control over tumorigenicity will be lost. Artificial chromosomes may be the key to solving both problems. The molecular stem cell biology laboratory researchers have already made some specific steps toward using artificial chromosome technologies to enhance their method's reliability for inactivating non-differentiated ESC and iPSC.

#2011-08-182

Russian scientists find new methods for treating vascular diseases

RAMS Petrovsky Russian Surgery Research Center (Moscow) develops new methods for treating vascular diseases connected with disturbed blood flow to lower extremities. Along with the basic approaches – pharmacotherapy and reconstructive vascular surgery (shunting) – the researchers developed a gene therapy with preparations that stimulate vessel growth.

One hundred thirty-four patients aged from 43 to 80 were included in a test for the gene therapy that stimulates vessel growth. Sixty patients in the control group received standard treatment. Along with standard methods, 74 patients in the main group were given injections with preparations that stimulate growth and additional vessel network development. These preparations improved blood supply in ischemic tissues. The preparations are genetically engineered constructions containing protein genes (vascular endothelial growth factor, angiogenin and fibroblast growth factor) that regulate vessel growth. Three genetically engineered preparations were tested. For some patients from the main group, gene therapy was used as an independent treatment method.

Patients were under observation for 0.5-4.5 years. Statistically reliable data demonstrated that in the main group the results were improved. As an independent treatment method, genetic therapy was effective only at a medium-stage extremity ischemia degree. The comprehensive treatment proved to be productive – shunting enabled restoring the basic blood flow in large vessels. The growth factor preparations created an auxiliary blood flow around ischemic tissues and improved blood microcirculation in distal leg segments (feet, fingers). Avoiding amputation was high (87.9 %). The maximum clinical effect durability was more than a year for 77–82 % of the patients (depending on the gene construction type used). Recorded among undesirable reactions to the preparations administered were systemic inflammatory reaction cases. As a whole, the proposed treatment method showed acceptable tolerance and safety.

#2011-08-183