One of the characteristics of traditional Japanese food is the presence of a wide variety of so-called fermented foods—foods produced using organisms so small they cannot be seen by the naked eye. There are so many fermented foods that it would be impossible to list them all, but some common ones still eaten today include soy sauce, miso (soybean paste), vinegar, sake, mirin (sweet sake for cooking), tsukemono (pickles), natto (fermented soy beans), narezushi (a type of sushi), katsuobushi (dried bonito flakes) and kusuyu (dried mackerel).

What is remarkable is not only the large variety of these types of food, but also the wide range within each type. Let’s consider soy sauce, for example. Historically, Japanese were not satisfied with the grain-based variety of soy sauce that is used widely today; available alternatives included the formerly popular fish-, meat- and vegetable-based soy sauces. The soybeans, barley and rice used in miso were substituted, in earlier times, with a variety of other grains, with nuts from the Japanese oak, and with horse chestnuts. In the Nansei Islands, residents even used nuts from the Japanese sago palm (cycas revoluta).

The same pattern applies to Japanese sake, which has rice as its main ingredient. The Heian era (794-1185) code Engishiki reveals the surprising fact that sake was classified into 13 categories, based on such factors as the degree to which its rice was pounded and the amount of koji (malted rice) used. Well-known sake varieties included gojou and retsush, the highest-grade sakes; zakkyushu, which was issued to public officials as part of their salary; shiroki and kuroki, which were used in Shinto ceremonies; and aoiwak, which was used in cooking. For more detailed information about these topics, interested readers may refer to my publications Hakkō and Nihonshu no Renaissance (A Renaissance of Japanese Sake), and others.

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to eat anything available; the dignity that comes from living from the ocean's bounty; and the commitment to maximize waste that is at the heart of Japanese cuisine.

Among the traditional fermented foods produced in Mikawa, Ono, Kanazawa and other locations around the city of Kanazawa, as well as in the Noto region in Ishikawa Prefecture, there is a dish made from fugu (blowfish) ovaries pickled in nukamiso (rice-bran paste). There is something distinctly grotesque in using a thing so deadly poisonous as the basis for a food dish, and something uncanny in utilizing the fermentation properties of a microorganism to detoxify that poison—and creating a food that is safe to eat.

The pickling of fugu flesh in rice-bran paste began at the end of the Edo period (1603-1867); the dish itself became a local delicacy at the start of the Meiji era (1867-1911). The main species used in the making of this dish were deadly poisonous varieties of fugu such as mafugu (torafugu), gomafugu, sabafugu and akamefugu. At first the rice-bran paste pickling process was only used on the nonpoisonous flesh of the fugu to produce a preserved food, which was a popular success. However, at a certain time of the year the female fugu develops an extremely large ovary. A thin membrane surrounds the ovary, but the ovary's interior is a dazzling bright yellow; it had strong appeal as the potential base for a new food dish. Tempting yes, but life is precious. In the case of torafugu, the ovary alone sometimes weighs over a kilogram and contains enough poison to kill some 20 people.

Yet throwing the ovary away seemed such a waste, and someone hit upon the idea of pickling it in rice-bran paste. At the time, nukamiso was an indispensable part of the daily diet, so the idea of pickling fugu ovary in something so close to hand probably came quite easily. Considerable time and expertise were required to detoxify the fugu ovary completely. No doubt the initial process was to remove the fugu ovary from the nukamiso every now and then and test it, a process that presumably produced some casualties. After a long process of trial and error, however, this strange food was finally perfected.

Similar approaches to food cannot be found outside Japan. And considering that pickled fugu ovary was developed by applying knowledge gained through daily living, it remains an almost overwhelming accomplishment. Indeed, this esoteric fermented food was not available anywhere in the world. The story embodies Japan's original approach to fermented foods, and also details many other wondrous examples concerning traditional Japanese fermented foods. Instead, I will choose to demonstrate how certain food products have been produced in Japan, where pickles are an essential part of the diet, and by the Japanese, who survive on the ocean's bounty.

Today, the production of pickled fugu ovary begins with the selection of the ovary. Instead of throwing away ovaries left over when fugu flesh is pickled in nukamiso or mirin, these remaining ovaries are set aside. One company alone cannot collect sufficient ovaries, so more are purchased from other fugu processors. Nowadays, efforts are made to obtain the best ovaries available, and they are also brought in from processing companies in Hakata and Shimonoseki. Next, the ovaries are placed in fresh water to remove any surface dirt, and the unwanted stringy tubes attached to the ovary's chorion are removed along with other extraneous materials. The ovaries are then placed in a tub and a 30% mix of salt is added. The resulting mixture is set aside for between six months and a year. The ovaries are then removed and pickled in nukamiso that contains a small amount of rice koji and some salted sardine or mackerel broth. They remain there, fermenting beneath a stone weight, for over two years before finally being shipped out or pickled in sake lees for another month. Compared to other pickled fish products, fugu ovaries have a higher salt content and are fermented for a longer time. The traditional explanation is that this approach removes the poison and indeed, the highly poisonous tetrodotoxin found in fugu before pickling has completely disappeared from the end product. Not only have there been no reported cases of death after eating this dish, it is nowadays sold as a regional delicacy at local souvenir stores in Kanazawa, as well as at pickle stores and specialty shops.

The actual mechanism for removing the poison is understood as follows: First, some of the poison is drawn out of the fugu during the salt pickling process. Most of the remaining poison is then broken down and neutralized by lactic-acid bacilli, yeast and other microorganisms during the nukamiso pickling process. The lactic-acid bacilli are smaller and more active than yeasts, and are therefore more effective in penetrating the fugu ovaries through the membranes, once these are broken down as a result of the salt pickling process. These bacilli break down the tetrodotoxin into carbon dioxide, water and nitrogen and then consume the nitrogen, thus rendering the toxin inert.

Finally, let's consider what it's like to eat fugu ovaries pickled in rice-bran paste. The aroma is quite strong and similar to that generally associated with Japanese pickles, but contains extremely pastoral notes with a nostalgic quality. The ovary's outside membrane is a dull light gray, but the ovary's actual interior is a vivid yellow, crammed with tiny eggs. This savory dish has a complex and rich sour taste, and a character that makes it hard to believe that it was once highly poisonous. It accompanies Japanese sake well, but according to an acquaintance of mine in Kanazawa, the best way to eat it is as ochazuke. This dish is prepared by filling a deep bowl about two-thirds full with hot rice, then adding a desired amount of crumbled fugu ovary over the rice. One then adds some grated wasabi (Japanese parsley) leaves, and a dash of powdered sansho (Japanese pepper). Finally, hot Japanese green tea is poured over the top. Ochazuke should be gently scooped into the mouth while the diner meditates on calming his or her fluttering heart. The flavor surpasses that of most other kinds of ochazuke—it arguably ranks among the top gourmet-style dishes in its category.

Let us not forget that this rather extreme Japanese culinary pastime of removing the toxin from the ovary of a poisonous blowfish in order to render it edible would not be possible were it not for the great respect the Japanese have for food; i.e., that they are loath to waste anything. There exists an endless curiosity that drives them to try any food along with a deep commitment to turn a rarity into a delicacy. And above all, there exists the enduring inspiration of Japan's unique, centuries-old tradition and technology of fermentation.