BACILLI IN BUTTER.

THE fact that milk affords a particularly suitable medium for the growth and multiplication of most micro-organisms, has rightly led to its being regarded as a dangerous vehicle for the propagation of disease. On the Continent the practice of boiling all milk before use, and so destroying any pathogenic microbes which may be present, is almost universal, and recently a number of special pieces of apparatus have been devised for household use, ensuring the efficient so-called "pasteurization" of milk. In England, however, we but rarely boil our milk in spite of outbreaks of diphtheria and typhoid fever having been not infrequently traced to a particular milk supply. In a paper by Cnopf on the bacterial contents of milk it is stated, that on one occasion out of every thirteen samples of milk supplied to Paris one was found to contain tubercle bacilli, whilst it is well known that the germs of typhoid, cholera, diphtheria, anthrax, &c., thrive readily in this medium. But although milk has been made the subject of much careful experimental investigation, comparatively little is known of the microbial condition of butter. Heim has shown that cholera bacilli purposely rubbed into butter could be demonstrated after thirty-two days, whilst typhoid bacilli similarly introduced were found after three weeks, and tubercle bacilli after the lapse of a month, although Gasperini discovered the latter in butter even after 120 days. Quite recently Lafar has published a paper, "Bacteriologische Studien über Butter" in the *Archiv für Hygiene*, in which he has recorded his investigations on the micro-organisms found in Munich butter. These experiments are instructive as exhibiting the fitness of butter to support a large number of bacteria, and thus furnish an interesting supplement to what is already known concerning the longevity of pathogenic microbes in this medium. The samples examined were prepared from fresh cream and were investigated as soon as possible after the butter was made. It was found that the number of microbes differed according as the portion for experiment was taken from the outside or from the interior of the piece of butter. Thus in one instance whilst one gram from the centre of the pat contained 2,465,555, on the outside in the same quantity as many as 47,250,000 micro-organisms were found. Taking the average of a number of examinations, it was estimated that the interior of a lump of butter possessed from 10 to 20 millions of bacteria in a single gram. Lafar is inclined to regard this as an under rather than an over-statement of the number, inasmuch as there are always probably present a certain proportion of microbes which will not develop at the ordinary temperature, or on the gelatine-peptone medium usually employed. He graphically puts it that, in some cases it is conceivable that the number of organisms swallowed with a moderately-sized slice of bread and butter may exceed that of the whole population of Europe! Lafar found that butter kept in a refrigerator, with a temperature of between 0° to + 1° C. at first (after five days) showed a marked reduction in the number of bacteria, but that no further diminution took place, although the sample was kept for a month at this temperature. Samples kept at from 12° to 15° C. exhibited a marked increase in the number of micro-organisms, a rise from 6 to 35 millions being observed in the course of nine days, whilst when placed in the incubator (35° C.) after four days the bacteria had fallen from 25 to 10 millions, and after thirty-four days only 5 per cent. of the original number present were discoverable. Experiments were also made to ascertain what was the bacterial effect of adding salt to butter kept in a refrigerator. It was found that although the numbers were thereby considerably reduced, that yet, even when as much as 10 per cent. of salt was added, the complete destruction of the bacteria was not accomplished. On examining, however, gelatine-plates prepared from these samples, it was ascertained that the organisms present consisted almost entirely of a pure cultivation of one particular microbe, which was apparently entirely unaffected by the addition of salt, and had grown and multiplied to the exclusion of nearly all the other bacteria originally present. When samples similarly salted were placed in the incubator (35° C.) the result was rather different, for whilst there was more apparent connection between the proportion of salt added and the diminution in the number of bacteria, more varieties of micro-organisms were found on the gelatine-plates. But in this case, also, the germicidal effect produced was not proportional to the increase in the amount of salt. Samples of artificial butter were also examined, and were invariably found to be much poorer in bacteria than ordinary butter. Thus, whilst the smallest number found in one gram was 747,059, in real butter considerably over two million microbes was the minimum. Two varieties of bacilli have been isolated and described, which were found very constantly present in butter throughout these investigations. They are beautifully illustrated and shown in coloured plates as individual organisms and colonies at the end of the paper. Lafar purposes continuing his investigations, and it is to be hoped that the examination of butter for pathogenic micro-organisms, about which so little is known, will form an important feature in any further researches he may undertake.

GRACE C. FRANKLAND.

THE OCCURRENCE OF NATIVE ZIRCONIA (*BADDELEYITE*).

THE discovery of native zirconia was first made public in my letter to NATURE (vol. xlvi. p. 620) in October last; at the same time I gave characters sufficient for the recognition of the new mineral, and suggested the name *Baddeleyite*, in honour of Mr. Joseph Baddeley who had brought the specimen with other dense minerals from Rakwana in Ceylon. As there was only a single fragment of what at first sight seemed a hopelessly imperfect crystal, the determination of all the important characters without appreciable injury of the specimen was a task of an attractive kind: the technical details of the investigation (including quantitative chemical analyses) and the line of argument by which definite results were evolved from the observations, were communicated to the Mineralogical Society at the meeting held on October 25 (NATURE, vol. xlvii. p. 70), and crystals of hydrous zirconium oxychloride prepared by identical methods from Baddeleyite and artificial zirconia, respectively, were exhibited for comparison. Having regard to the unexpected result of the chemical examination and the difference of the characters of Baddeleyite from those of artificially prepared crystals of zirconia, every care had been taken to get results as accurate as the material itself would admit of.

Of course it was hoped that the occurrence of native zirconia, once established, would soon be noticed elsewhere; and in fact, I hear this morning (January 3) from Dr. Hussak of the Geological Survey of Brazil, that flawless crystals of zirconia are actually met with in the south of São Paulo as an accessory constituent of an augitic rock described under the name of Jacupirangite by my friend Mr. O. A. Derby.

The Brazilian mineral had three or four years ago been regarded by Dr. Hussak (who had then only a small amount of material for examination) as probably orthite (silicate of cerium, iron, &c.), a mineral with which it agrees in its more obvious external characters, and it was mentioned later under that name in Mr. Derby's description of the Jacupirangite; but more recently Dr. Hussak, on isolating a score of flawless crystals from the decomposed rock, recognized the distinctness of the mineral from orthite, determined the geometrical and physical characters of the crystals, and decided from a chemical examination that the material was a tantalo-niobate of probably some member of the yttrium-cerium group: these results were published in the *Neues Jahrbuch für Mineralogie*, 1892, Band II. p. 142, immediately after my announcement of the occurrence of native zirconia in Ceylon had been sent for publication, but they had been forwarded from Brazil as early as the month of June. Dr. Hussak now informs me that the Brazilian mineral, which had been sent to Sweden for a complete quantitative examination, has been determined by Prof. Blömstrand to be almost pure zirconia.

As regards crystalline form, the parametral elements obtained by myself for Baddeleyite, and announced at the meeting of October 25, agree in a very satisfactory way with those determined by Dr. Hussak for the Brazilian mineral, while as regards optical characters, the two descriptions are practically identical. The only important deviation of external character is in the specific gravity; that of Baddeleyite is 6·025, that of selected crystals of the Brazilian mineral is 5·006.

Now it seems almost impossible that the specific gravity of crystals of a simple oxide presenting otherwise identical characters can vary to this extent, and the explanation of all the difficulty will probably be found to be that Dr. Hussak's specimens really belong to two distinct minerals; that while the crystalline form and optical characters were determined from the one (zirconia), the specific gravity and the chemical composition