6. Proofs and refutations

It was not self-evident how the results of lamb blood transfusions should be assessed. Physiologists making animal experiments thought species-alien blood was poison. Practicing doctors were not so sure. They distrusted laboratory evidence when their clinical experience told them otherwise. Neither mode of production of medical knowledge could give definite proof one way or another about lamb blood transfusion. The result was quarrels and confusion.

It is late January 1875. In the Physiological Institute of the University of Greifswald in northern Germany, Professor Leonard Landois is busy completing a series of animal experiments. They were the last of many experiments that he would publish in a large monograph later that year.[1] Landois had, since the mid-1860s, made more than 300 experiments moving blood between animals of different species. He had, for example, injected frogs with blood from dogs and pigs, and transfused dogs and rabbits with human blood and with blood from sheep, guinea pigs, calves and cats.

What emerged from these, no doubt often messy, experiments was that species-alien blood dissolved in the blood of the receiving animal. This then acquired a deep ruby-red colour from the haemoglobin, set free from the red blood cells. Landois saw the dissolution as a clear proof of the uselessness and danger of transfusing species-alien blood.

He also performed what he called pre-transfusion experiments. He used the microscope to check what happened when serum from one animal was

mixed with blood cells from another. He found that the globules first adhered together and became spherical. They then lost their colouring matter. Soon only a sticky clump of fibres remained, formed by the red blood cells. This reaction, Landois thought, was due to 'a strange, to us still unknown effect of the mixture with the [serum's] constituent elements.'[2] Twenty-five years later, Landsteiner would find the same reaction when he mixed blood and serum from individuals of the *same* species; he concluded that their blood belonged to different and incompatible 'blood groups'.[3] Of this, Landois, of course, knew nothing. His hypothesis in the 1870s was that such clogging appeared if the blood and serum came from two *different* species. He saw it as yet another indication that transfusion with species-alien blood was extremely dangerous: it would lead to embolism, inflammatory phenomena and, ultimately, death.

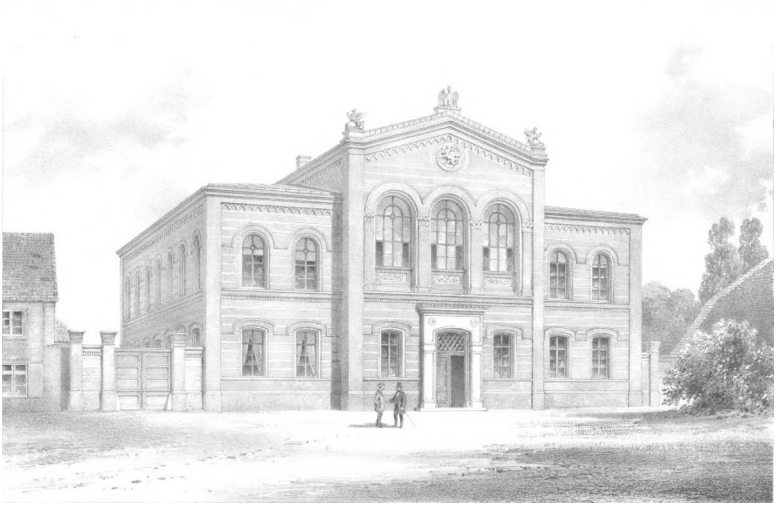

Figure 21. The Anatomical Institute of the University of Greifswald in 1855 (Zeitschrift für Bauwesen 1861, 53). Landois' Institute of Physiology was housed in this building until it got its own in 1888.

Landois' condemnation of lamb blood was echoed by other physiologists. In late 1874, professor Ponfick of Rostock and, in 1875, the Norwegian physiologist Worm-Müller published lengthy critiques based on their animal research; Ponfick had also made one (unsuccessful) lamb blood transfusion.[4] In

1875, too, the Copenhagen physiologist P. L. Panum published a more than ninety-page diatribe against Hasse and Gesellius; he followed it up in 1876 with a further attack when Hasse had responded to his first text.[5]

Thus, the use of animal blood was contentious. A French physician, Louis Jullien, summarized the situation in 1875:

> As we can see, the discussion is vividly engaged. Will Gesellius and Nordhausen [i.e. Hasse] succumb under the weight of attacks coming from so high up? Nobody can currently predict the outcome of this struggle. Let us note here, however, that while the transfusionists rely on observation and put together the most persuasive facts to convince us, the opponents, disdainful of the sick and confined in the heights of physiology, do not put forward a single clinical argument; so that if we had to summarize the state of minds concerning animal transfusion, we would be inclined to write: the clinicians accept it and welcome it; the physiologists condemn it.[6]

At stake in these disputes was *what kind of evidence* should determine the future of transfusion as a medical therapy. For physiologists and their supporters, animal trials had clearly shown that lamb blood transfusion had little foundation in science; it was a dangerous experiment on fragile patients. On the other side, '[n]o clinical practitioner would let physiologists lay out the law for them without enough clinical testing', as the Swedish doctor Curt Wallis argued.[7] For practicing physicians, desperate to find a cure for phthisis, pellagra, anaemia and other wasting afflictions, lamb blood transfusion seemed a promising way forward. Despite disappointments, many argued for continued clinical trials. It was necessary to keep on trying and trying again.

The quarrels concerning lamb blood transfusion are instructive. They illustrate the difficulties at the time in reaching a consensus about what should count as reliable medical proof. Traditional forms of medical knowledge production competed with new, science-based ones. Laboratory scientists and practicing doctors understood the sick body differently: why it was ill and how it could be cured. They worked in different social settings, with different means of gaining knowledge and assessing it.[8] This meant that neither group would readily accept the other's results as conclusive evidence. In addition, neither mode of medical knowledge production was, at the time, sufficiently developed for its arguments to be immune to criticism, and blood itself was poorly understood. We are on 'the wide field of conjectures, beliefs and hopes', as one German surgeon phrased it in 1874.[9] Lamb blood transfu-

sion was therefore, in a sense, a *mystery*; it was not self-evident how its effects should be understood.

This chapter will not resolve the enigma, but it will illuminate the controversy. We will listen to the arguments for and against lamb blood transfusion. For this purpose, we will first visit three social milieus where medical knowledge was produced: the village doctors' surgeries, the urban hospitals and the physiological laboratories. These were settings where, in the 19th century, only men were considered experts; women were patients and sometimes nurses, and with very little say in what went on. In all three surroundings, thus, male professionals produced knowledge about transfusion, but in different ways, with different goals and means. No wonder that they – the practicing doctors and the experimental scientists – sometimes were not ready to accept each other's arguments and results.

We start by renewing our acquaintance with Oscar Hasse, a fine representative of what may be called 'bedside medicine'. How did he (and doctors like him) gain knowledge about disease and cure? How did their everyday practices colour their understanding of lamb blood transfusion?

Bedside medicine

Hasse was a private practitioner working in and around the town of Nordhausen in northern Germany. He took care of all kinds of medical problems and he sometimes performed transfusions, either in his clinic or in the home of his patients. He was then often assisted by a neighbour, 'an elderly gentleman of Nordhausen, not a medical man, but someone who had the advantage of having already frequently assisted Dr Hasse – a necessity for carrying out the operation with precision', reported a patient who, suffering from consumption, had asked to be transfused by Hasse.[10]

A local doctor, like Hasse, 'had to know the individual dispositions of his patients, their ways of life, and their joys and sorrows.'[11] His patients were mostly rural or small-town middle class. Most would have the means to pay for his services, and, if necessary, for the use of a lamb. Hasse's decision about whether to transfuse or not had to be negotiated at the sickbed with the patient and the family; a sometimes delicate situation. The patients' own descriptions of their condition and their wishes for treatment played an important role. 'These are unfortunately the downsides of the practice in general, that the doctor not only has to deal with the disease but has to struggle with

various elements surrounding the patient!', a contemporary German doctor complained.[12]

Figure 22. A doctor at the bedside. Painting by Luke Fildes, 1891 (https://commons.wikimedia.org/wiki/File:The_Doctor_Luke_Fildes_crop.jpg).

A fair number of those inspired by Hasse's example were doctors in private practice. Their transfusion reports hint at a certain pride that a country doctor could invent a therapy adopted by hospitals across the world. That this was the case did, on the other hand, greatly annoy the celebrated Danish physiologist Peter Ludvig Panum. He had studied in Paris and Würzburg and worked with Rudolf Virchow and Claude Bernard. He was professor in Kiel but moved to Copenhagen at the start of the Danish-Prussian War. Panum had made many of the animal experiments that, from the early 1860s onwards, were used as evidence for the value of indirect transfusion with defibrinated human blood and, also, as proof of the dangers of species-alien blood.[13] He now, in 1875 and 1876, published two quite sarcastic articles where he dismissed Hasse's (and Gesellius') evidence for the positive effects of lamb blood – it was totally fraudulent and misleading. Hasse, being a simple 'provincial doctor', had not, Panum claimed, understood the finer points of physiology but had based his suggestions on the sole but erroneous criterion of success at the bedside. The result was a hazardous gamble for the unfortunate patients.[14]

Panum was particularly upset about the many innocent 'village doctors' misled by Hasse and Gesellius. Naturally, they could not keep up with the complex developments in physiology and had therefore 'to an unfortunate degree been groping in the dark as to the indications for a transfusion'.[15] Their ignorance and 'misdirected ambitions' had fooled them into following Hasse's example, and apply the method for conditions – phthisis, cholera, leprosy, scurvy, melancholy, erotomania – that could never be helped by a transfusion. In this way, a dangerous 'epidemic' of lamb blood transfusion had spread across Europe, from Petersburg to Bonn, from Copenhagen to Italy:

> Hitherto unknown doctors have with the help of the reintroduction of the DENISian lamb blood transfusion achieved large local fame by establishing themselves as lamb blood transfusionists in villages blessed with lamb, where tens of phthisikers and other luckless patients have been transfused with the symbolic blood of lamb.[16]

Panum was right in that local doctors often did grope in the dark. Their patients' condition was frequently difficult to diagnose. It is worth recalling that average life expectancy in 1871, in for example Germany, was only thirty-seven years. Many children did not survive their first years but adults, too, had a hard time.[17] Local doctors performing a blood transfusion would first, they reported, have tried their usual therapies: enemas, hot and cold water cures, injections of ergotin, doses of opium and morphine, diets with meat or herb extracts – but to no avail. As a last resort, they tried blood transfusion. To them, the blood of a lamb seemed just as beneficial as that from a human being and less painful for the donor. And a lamb was perhaps (as Panum implied) easy for a village doctor to procure.

To gain knowledge about their patients' condition before and after a transfusion, these doctors employed quite simple means. They used their intuition and their five senses. They reported having checked their patients' temperature and pulse, sleep and appetite, as well as their urine and stools. They listened to the patients' breathing and heartbeats, looked at the colour of face, feet and hands, checked for urticaria, and smelled the patients' often quite unpleasant breath and sputum. In some cases, they used a microscope to assess the presence of red blood cells and albumin in urine, but they did not count the number of blood cells. In only one case reported by a village doctor was an autopsy performed; this was something that otherwise only took place in hospitals.

Hospital medicine

Local doctors sometimes also worked in nearby hospitals, and some performed transfusions there, too. In fact, most transfusions in the mid-19th century, including those with lamb blood, took place in hospital settings – in city hospitals, asylums, spas, and military hospitals.

The physicians and psychiatrists performing transfusions in these settings were certainly no unknown 'village doctors'. They were highly educated. Several were or would become professors, chief military surgeons, heads of clinics or mental hospitals. Panum was perhaps aware of this situation when he added that it, in no way, had been only ignorant provincials 'who with some enthusiasm had resorted to using animal blood [...] but also several renowned and undoubtedly honourable men'.[18]

These 'honourable men' were often explicitly supported by their hospital administrations and colleagues. Their transfusion attempts, be they with human or animal blood, were seen as important experiments. Results were reported in books, articles and dissertations. Medical societies across Europe and the USA held meetings and organized committees to debate transfusions. Thus, the mid-19th century transfusion experiments reflected professional ambitions within several medical communities (most noticeably perhaps within Italian psychiatry) and were not primarily individual whims.

The transfusion situation itself was an important occasion to communicate findings and observations, influence students and colleagues and even, as we have seen, impress royalty and the general public. This ambition to publicly inform others of clinical results was part of what we may call a 'hospital mode of knowledge production'. In contrast to bedside practices where the doctor's knowledge of their patients' condition was a kind of local and private property, the new ideal was communication. To further medical progress, and their own careers, physicians had to make their experience known to a wider medical community. Journals and meetings constituted a sphere where medical knowledge was presented and judged. Acclaim of peers within this larger, public domain was an endorsement of the doctor's position as an expert.[19] Meetings and conferences, and the medical press, were venues also for debates, quarrel and controversy; this certainly turned out to be the case for lamb blood transfusion.

How else did knowledge production in the hospital differ from that at the bedside? In the mid-19th century, physical examination (inspection, palpation, percussion and auscultation) had become routine diagnostic practice within

hospitals (as seen, for example in Figure 23). Bodily functions, such as temperature, respiration and pulse were systematically measured and charted. These diagnostic practices were largely similar to what was used in bedside medicine. What differed were two things: the generalising ambition of the hospital mode of knowledge production and the nature of doctor-patient interaction.

With a start in the large Paris hospitals of the early 19th century, knowledge about diseases and appropriate means of redress was produced through careful clinical observation, classification of symptoms and diseases, and systematic recording of hospital statistics.[20] Such investigations were possible in hospitals with their many patients who could be observed for a stretch of time and, if they died, be subject to autopsy. Physicians could then correlate the signs and symptoms they found in the living patients with the structural changes they observed in post-mortem examinations. They could use surgical techniques to dissect the bodies and find exactly where the disease had been located. In this way, pathology became the foundation for a unified art of healing.[21]

In the 1850s, this localized theory of disease was radically revised by the work of the German physiologist, Rudolf Virchow. To him, the seat of disease was no longer the organ or the tissue as such but the cell; surgeons could therefore cut out the diseased cells without compromising the function of the rest of the body.[22] Sophisticated surgical interventions to treat disease by removing organs or parts thereof could now become standard elements of hospital medicine. They did not belong to the bedside doctors' repertoire since they required operating rooms, instruments and medically-trained assistants.

The nature of doctor-patient interaction changed, too, with the advance of hospital medicine. A culture of medical paternalism where the physician's authority reigned supreme characterized many 19th century hospitals. The 'previously shared knowledge about disease between patients and their physicians, so useful in forging a trusting relationship and negotiating therapeutic strategies […] was shattered. For treatment, patients now became much more dependent on their physician's knowledge and judgment', a later historian summarized the situation.[23] Hospital patients were mostly poor or working class and many were illiterate, something that left doctors with great margins for what to do, how and when. Patient status was communicated in a technical language that most patients found hard to understand. At meetings and in articles they were made into 'cases' or became items in aggregate statis-

tics of diagnoses and therapeutic results. This lack of personal doctor–patient involvement was sometimes regretted by physicians: 'Medicine [looks for] … facts, it has become objective. It does not matter who is at the bedside, the sick person has become a thing', a German doctor protested in 1870.[24]

Figure 23. A visit to the hospital. Painting by Luis Jimenez Aranda 1889 (https://commons.-wikimedia.org/-wiki/File:La_-visita_al_-hospital_de_-Luis_Jim%C3-%A9nez_-Aranda.jpg).

Hospital doctors of the 1870s could perform quite advanced surgery with the help of anaesthetics and Listerian antiseptics. Such interventions were now less painful and more likely to succeed. Otherwise, and judging by their transfusion accounts, they used much the same remedies as the local practitioners. Homeopathic and hydropathic treatments were common. Doctors made turpentine enemas, used ether injections, applied mustard plaster on breast or legs, administered lead lotion, chinine, eucalyptus tincture or Carlsbad waters. Extracts of meat, malt and milk were given and there was, 'a vogue for the use of alcoholic beverages as stimulants'.[25] Transfusion patients were served red wine, champagne, port or milk mixed with brandy, sometimes before but most often after the ordeals of the intervention.

Hospital doctors were university trained. They had a fair amount of theoretical knowledge. Some – especially the Italian alienists – held scientific ambitions; several had extensive research activities. There was a strong sense that clinical interventions should be based on science. But blood was in many ways a mysterious fluid. Theoretical knowledge of its components and their function in the body was still limited. This did not prevent many of those doing a lamb blood transfusion from backing up their results with various, more or less well-grounded physiological arguments. But *real* science, their opponents argued, was not done by clinicians in the hospitals – it was performed somewhere else.

Laboratory medicine

We therefore move to a third place for the production of medical knowledge – the laboratory. For example, to the one of L. Lesser, a physiologist in Berlin. Here he is, in 1874, giving a lecture to members of the Obstetrical Society of Berlin:

> Permit me […] for a few moments to take you away from the bedside into the experiment-room of a physiological laboratory. The experimental physiology of the blood will, I trust, give you a better answer to many obscure questions in the study of the replacement and saving of blood, and you may also find in it a more certain footing for your medical treatment than in all the casuistry hitherto so prevalent in the science and art of therapeutical transfusion.[26]

Beginning in the mid-19th century, well-endowed physiological and pathological laboratories for research and education were established across the German-speaking world. They were to be found in, for instance, Heidelberg, Greifswald and Zürich and, on a more 'grandiose scale', in Vienna, Berlin and Leipzig, as an impressed French medical emissary reported in 1870. Nothing like it existed in France or even Great Britain.[27]

Work in these laboratories would, as Lesser and others claimed, put medical treatment on 'a more certain footing' than mere clinical experiments would allow. The local village doctor could in an emergency hardly deliberate on the solubility of blood-corpuscles or whether to use a direct or indirect method of transfusion, argued a writer in the *Medical times and gazette* in 1874. Instead, 'these and the other points involved should be decided for him by the

clinician, whose labors, it seems to us, should be based on the results of the physiologist.'[28]

Figure 24. The histological laboratory, San Lazzaro Asylum, Reggio Emilia. (Courtesy of San Lazzaro Asylum Archive, Reggio Emilia. Album A7 photo n. 11, C d 4.12 immagine 013.)

Physiological experiments, thus, were thought to give the solid knowledge about tissues and cells needed for hospital medicine and, eventually, bedside care. Such information was, in the case of transfusion, largely based on animal experiments; it was assumed that their results were valid also for how the human body would react.[29] Laboratory manuals and accounts of the time provide detailed, sometimes gruesome, insights into how the scientists worked, their techniques and their treatment of the animals.[30] Landois, for example, whom we have met earlier in this chapter, subjected large numbers of animals to often painful experiments and careful observations. He employed a modified Aveling transfusor to move blood from one animal to another, a kymograph to measure blood pressure in the transfused animal, and various

contraptions to fixate and inject the frogs on which numerous experiments were made.

By the early 1870s, laboratory medicine had, it was argued, reached the conclusion that only blood from the same species could safely be used in transfusion. But then, suddenly in 1874, practicing doctors across the world claimed success against various diseases using lamb blood transfusion. To the astonished physiologists, it seemed as if 'everything that [they] had shown was built on loose sand and destined to collapse in the face of a rapidly gained practical experience', the Swedish physician Warfvinge remarked.[31]

To this challenge, the experimental scientists reacted in two ways. First, with verbal counterattacks. For Panum, the struggle was now between 'crude, unscientific, uncritical empiricism', on the one hand, and 'scientific medicine that makes use of physiological, pathological and pharmacodynamic experiences and facts', on the other.[32] He was echoed by the Swedish pathologist Rossander:

> For the sober and sceptical observer, some miraculous cures are not proof enough; he wants to see clear reasons and arguments, he demands for the solution of such great questions, not simply some more or less successful 'cases' but a scientific foundation for these.[33]

In text after text, the 'calm, conscientious' and 'sceptical' scientist was set against the uncritical and hectic, even maniac, advocate of lamb blood transfusion.[34] Hasse was the prime target; he felt the attacks quite keenly and personally. He accused the physiologists of vilifying him to scare doctors away from performing potentially life-saving transfusions:

> Our most important physiologists with all the force of their authority, with the sharp weapons of their minds, with all the equipment of their physiological laboratories, and with their numerous auxiliary troops of assistants and pupils, use this erroneous image [of lamb blood transfusion] to make the simple provincial doctor worried and afraid.[35]

Secondly, the physiologists set to work to produce more laboratory evidence for their case. Professor Landois soon demonstrated, with a new series of experiments, the perilous effects of lamb blood transfusion, while Professor Ponfick in Rostock found that red blood cells of species-alien blood dissolved in the receiving organism's blood plasma. Its haemoglobin would then excrete into the urine to cause haemoglobinuria, a potentially fatal condition, and the kidneys would get overworked.[36] Once again, it seemed that science, as one

observer phrased it, had dealt 'a crippling blow to the troublesome direct lamb blood transfusions'.[37]

Still, the verdict was far from clear. For a clinical intervention, such as lamb blood transfusion, to be considered beneficial and safe, it seems that at least three conditions have to be met. Firstly, it should, if possible, be based on theory and scientific evidence. This was a new idea in the 19th century and, as we shall see, not without its problems. Secondly, it should make the patient better, also in the longer perspective. And thirdly, it should be safe and not cause undue harm. If and how these conditions were met was, at the time, a matter of contention.

I find the arguments presented for and against lamb blood transfusion worth discussing in some detail. They signal a genuine uncertainty, not only about the effects of this particular intervention but, more generally, about how different kinds of medical evidence should be assessed and compared. Hospital and bedside based doctors tended to favour clinical experience and distrust animal experiments; physiologists thought quite the opposite. Still, the evidence was far from clear-cut; there were doubts on both sides as to the relevance of their respective arguments. Or, as noted by a somewhat disillusioned observer: '[T]ransfusion has [recently] become a favourite object of physiologists, experimental pathologists and many surgeons. The [...] literature has risen to an enormous height, but with it also the confusion'.[38]

Laboratory experiments contested

To sort out this confusion somewhat, I will first summarize the critique against the merit of animal experiments. I will then consider the other side: the arguments for and against the merit of clinical experience. A somewhat inconclusive situation will emerge. But perhaps the statistical treatment of available data may help in reaching a consensus? An unfounded hope, as we will see.

I start with the laboratory experiments that, physiologists argued, dismissed lamb blood transfusion as useless and dangerous. But some lamb blood proponents did not accept these results as evidence. They questioned how the experiments were carried out and their relevance for clinical practice. For example, the Austrian military surgeon, Neudörfer – whom we have met as a supporter of lamb blood transfusion in war and peace – argued that the serum used by Landois was an artificial product that dissolved red blood

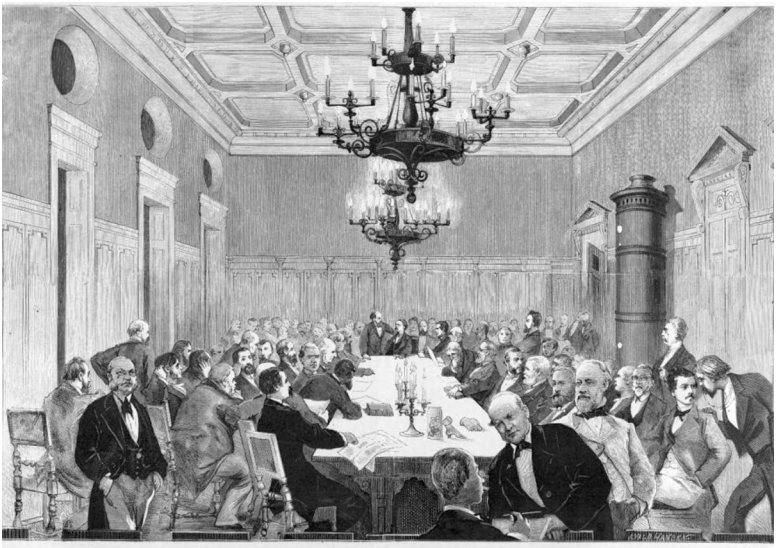

Figure 25. A meeting of the Swedish Medical Society in 1879. Illustration by Carl Larsson (Ny Illustrerad Tidning, December 27, 1879, 401).

cells much faster than what would happen in the human body. Thus, conclusions drawn from his experiments might not be relevant for clinical practice.[39] Roussel, too, was critical of the particular transfusion instrument (Aveling's, not his) used in Landois' experiments:

> This physiologist transfused dog's blood to cats, frog's blood to rabbits; he operated, and he showed his results with the patience and detail characteristic of the Germans. [But] this long study is tainted with inevitable errors produced by an unreliable transfusion method. He can affirm, neither that the blood used has not been altered on contact with the air, nor that the blood itself has retained all its qualities and physiological force.[40]

Other commentators were sceptical about inferring conclusions from animals to humans, and from healthy individuals to sick ones. Even the physiologist Emil Ponfick, who had demonstrated that dissolving lamb blood cells caused a potentially fatal haemoglobinuria in the recipient, was somewhat reticent. He

warned against drawing strong conclusions from animal studies. The British journal, *The Doctor*, summarized his reluctance:

> In terminating his remarkable work […] Ponfick declares that he in no way intends to infer from what he has noticed in some animals, especially in dogs, what would take place in man; he also does not desire to resolve the most important questions in practical medicine by considerations solely based on observations made on persons in good health. His aim in writing these lines was simply to augment our knowledge as to the influence of transfusion on the animal economy.[41]

Another contention concerned the *amount* of blood transfused. Laboratory animals, in contrast to human patients, often received quite a lot of blood. This issue was raised by a number of critics. One was the French physician, Jean-Cyprien Oré, in Bordeaux, a pioneer of anesthesiology with a long-standing interest in transfusion. To those who argued that animal blood transfusion was both useless and dangerous, he countered that this depended not on the *kind* of blood transfused but on *how much*. He himself had transfused dogs with blood from various animals with no danger to the animal and with no destruction of the red blood cells transfused. The adverse effects encountered by others were, he argued, due to them administering an overabundance of blood given the weight of the recipient. Thus, it was not surprising that these physiologists would encounter bloody froth and urine, followed by the death of the transfused animal.[42]

Other lamb blood defenders agreed. A blood transfusion to a human patient would only introduce some ten to twenty per cent of what the scientists gave their laboratory animals. This small amount of transfused blood would then act as a drug, not as a poison. The Swedish pathologist Rossander (though a sceptic to lamb blood transfusion) somewhat cheekily remarked:

> The physiologists may experiment with their poison, inject dogs […] with large doses thereof, but in small doses any poison may under certain circumstances become a medication. If you inject enough morphine or strychnine into an animal, you will kill it; this does not prevent both from being excellent remedies for humans. The same may be the case with haemoglobin.[43]

There were other problems, too, with inference from animal experiments. 'The experiment only teaches us how animals fare', the German doctor, Jahn, argued. Despite being favourable to experiments, he noted that 'no experiment gives us information about the success of transfusion in various internal hu-

man diseases that we cannot produce experimentally in animals'.[44] This was a valid remark, most relevant perhaps, for the cases of insanity treated by the Italian alienists. I have found no account of transfusion experiments on, for example, mad dogs, from which conclusions to human mental patients could have been drawn.

Thus, there were question marks concerning the relevance of laboratory evidence for clinical practice. But, on the other hand, how reliable was the clinical experience? How beneficial was lamb blood transfusion, in the short and the long run? Here, too, the data was partial and confusing, leading to contrasting views on its merit as evidence.

Clinical experience contested

Two main types of methods were at the time used to prove, or disprove, the efficacy of a clinical intervention. The first was close observation and comparison of data from individual cases, the second statistical analysis of the information from a large number of cases. Both methods were referred to in the debate and both were beset with problems.

Doctors who had tried lamb blood transfusion, seemed quite eager to report on their experiences, both positive and negative ones, and sometimes in quite long-winded detail. Many claimed amelioration or full recovery of their patients. The Swedish physician Lamm summarized the situation, as he saw it in 1875, as follows:

> Genus homo can, according to what experience has shown us, quite well support immediately transfused blood from the sheep species […] Also after necessary discount of the authors' accounts, it seems that one cannot doubt the good effects on humans of lamb blood, that is, of heterogeneous blood in toto. I have noted no deaths by poisoning from the transfusion of such blood.[45]

Such results, the German doctor, von Cube, maintained, were 'an example of the favourable effect of this operation, although it may at times be incompatible with the results of scientific research'.[46] As Jullien hinted above, doctors being close to their patients saw the worth of the intervention differently than did scientists who were 'disdainful of the sick and confined in the heights of physiology'.

The clinicians' case reports were, however, not always easy to interpret. The Swedish doctor, Ivar Svensson in Oskarshamn, who had tried transfusion with both human and animal blood but with little success, saw most case reports as expressing wishful thinking among doctors and patients hoping for a miracle cure.[47] Even supporters, like von Cube, had to admit that many positive accounts were based on such unfounded assumptions, even speculations, that they could not really promote the cause.[48] The reader may remember the puzzlement of the Dresden physicians, Fiedler and Birch-Hirschfeld, who made careful comparison of their own (unsuccessful) and Hasse's (successful) transfusions to phthisis patients. No relevant parameter seemed to account for the difference in outcome. Although they themselves were against what they considered to be a painful operation, their conclusion was to wait and see what future experience would bring.[49]

One particularly contentious aspect concerned how much lamb blood was actually transfused, an issue that I referred to in chapter 4. For Panum, it was most likely that only very small amounts of blood had been transfused in each case; that was, to him, probably the only reason why no patient had died from a lamb blood transfusion.[50] For some lamb blood supporters, on the other hand, like Oré and the Italian psychiatrists, it was precisely this manoeuvre – the transfer of only small, but repeated, amounts of lamb blood – that allegedly made for its success.

Another point of contention was that most published case reports were quite poor in information. Lamb blood transfusions may have been called 'experiments' but they were not, properly speaking, clinical trials, critics argued. There was simply not enough data presented. 'Innumerable experiments have been performed but without any precise settling of the question and without any strictly scientific method', Lesser argued.[51] Some Italian scientists were extremely critical of the cases presented by, for example, Ponza and Manzini and Rodolfi: their accounts were allegedly short of useful clinical data, with no blood counts and no systematic descriptions of the patients' weight, temperature, the state of their kidneys and other clinical data.[52] Landois had a similar critique of Hasse's reports:

> But one aspect in particular has always remained incomprehensible to me: why has this modern Denis not one single time used a prick of a needle to get a small drop of blood from his patients for the microscopic examination of for how long time the lamb cells are still visible in [the human recipient's blood]? That would surely have made him change tracks.[53]

Thus, no real conclusions, critics argued, could be drawn from these so-called experiments. It was impossible to ascertain why some people felt better after a transfusion while others did not improve or even died. Perhaps it was not the transfusion itself that had helped the lucky ones but something else? Phthisis patients, for instance, often recovered spontaneously, as did some early stage pellagra patients. Also, many of those transfused were poor people who had left their insalubrious surroundings; they probably gained strength more from the food, rest and care in the hospital than from the transfused blood.

A further important question concerned how one should define 'success'. Some transfusionists counted an only temporary improvement as a positive result. The increased appetite, the good night's sleep and the improved digestion could, they argued, help the patient recover and be ready for other treatments; thus a transfusion was worth trying.[54] For other physicians – like Dr Mayer, a private practitioner in Munich – the intervention was a humanitarian, and thus beneficial, act in an otherwise hopeless situation:

> It's more comfortable, of course, to let [the patient] die quietly so as not to torture him any more, as the popular expression goes, but it is inhumane and as a doctor I hold to the obligation to prolong, even if only by 5 minutes, the life of a person who has confided in me for help.[55]

The problem with statistics

When the number of case reports began to pile up, there was need for an overview. Quite a number of statistical evaluations of *human-to-human* transfusions had already been made. Martin had published one in 1859, Oré one in 1868, von Belina one in 1869, Marmonnier one in 1869, Sacklén one in 1870, and Gesellius one in 1873.[56] Now, it seemed useful to compile and evaluate statistics also about *lamb* blood transfusion.

In principle, such compilations could be instructive. Still, there was a major problem. Given that the case reports on which they were based were so incomplete, they were not easy to systematize and compare. Here is Dr Jahn again. He was, as noted above, sceptical of existing laboratory studies but he also questioned the possibility of drawing conclusions from compilations of extant cases. He had found a number of difficulties in the statistics available in 1874 (when the figures only concerned transfusions with human blood):

> These statistics list a large number of experiments made on sick people that seem to possess a higher value and provide better proof than those done on animals; but with this advantage come some very significant disadvantages. None of the observed cases is based on such simple and precise questions as we demand of an experiment, and so many other circumstances are involved that the separate cases are of no use. We may seek to counter this inconvenience by compiling a large number of cases and comparing them with one another in order to eliminate the incidental coincidences attached to each individual case. No matter for what purpose the statistics are to be used, to answer our questions with certainty requires large series of cases, much larger than what the previous literature on transfusion has been able to provide.[57]

Hasse clearly understood the importance of getting a large set of detailed data. Already in April 1874, at the Congress of the German Surgical Society, he distributed a questionnaire, asking his colleagues to report details of their upcoming lamb blood transfusions with indications, procedure and results, and send the information to him. He obviously expected a high number of replies.[58] Of this initiative, however, no more was heard (except that Panum made fun of it).

Others, however, compiled statistics from published lamb blood transfusion reports. In 1876, the French doctor, Jean-Cyprien Oré, published an update on his 1868 human-to-human transfusion statistics. He argued that his compilation of animal blood transfusions as well as his own animal experiments (see above) had shown that lamb blood transfusion was both useful and safe. He based his argument on 154 reported observations of lamb and a couple of cases of calf blood transfusions to humans. Especially instructive were, in his view, the Italian cases where very little blood had been transfused. The Italian alienists had reached, Oré thought, the most remarkable results with only few strong side-effects. He concluded his overview by affirming that: 'once more, the clinic has confirmed in a striking manner the results established by experimental physiology'.[59]

Two other attempts to compile and analyse case reports are worth noting. They were made by the German, Landois, and the Swede, Warfvinge, in 1875 and 1876, respectively, with quite different goals in mind. Landois wanted to show the danger and uselessness of lamb blood transfusion while Warfvinge wanted to stress its possibilities. But none of them was capable of doing a sophisticated statistical analysis and their data were, as indicated above, un-

certain and incomplete (the same can be said of Oré's report). Warfvinge's results were in favour of lamb blood transfusion but quite weakly so and only in cases of anaemia. Meanwhile, Landois did not discriminate between direct and indirect transfusion when counting the varying results of the intervention (death, favourable, unfavourable, tentative), and did not publish any percentages. Later commentators found that his figures actually went against his conclusion that lamb blood transfusion was dangerous. Only twenty-nine per cent of the lamb blood patients died compared to fifty per cent of those transfused with human blood.[60]

Of particular interest are the compilations made about lamb blood transfusions to phthisis patients, the subject of chapter 4 above. In 1876, the Swedish doctor, Curt Wallis, counted sixty-five international cases of such transfusion. Of these, nine patients had died, thirteen had improved, and the rest (forty-three) had experienced no improvement or their fate was unknown.[61] To this list, I (with the benefit of being able to scan the international literature with digital methods) can add thirty-five cases not included in Wallis' account. Of these, six had died, twenty improved, and nine got worse or their situation was uncertain. Overall, thus, a third of the phthisis patients, some of whom had been in a very sorry state before the transfusion, were reported as improved. At the same time, two thirds were most likely not and the positive estimates are highly doubtful, given the scarcity of medical information and the very short time, in some cases, between the transfusion and its reporting.

Not surprisingly, Panum was sceptical about such compilations of clinical cases, be they of human or lamb blood transfusion. He considered them incomplete and the cases so heterogeneous in their indications that they were useless for all practical purposes.[62] The Italian physician and psychiatrist, Cesare Lombroso, agreed. Quite different diseases had been grouped together; benign illnesses had been labelled as incurable ones to show the wonders of a transfusion; deaths occurring after some time were not reported; the impact of deficient instruments was not taken into account, nor were the possible differences registered between transfusing robust young patients and more frail, older ones, etc.[63] Roussel, who was sceptical to everything except his own instrument, refused to compile any statistics at all, not even of his own numerous transfusions:

> Whatever others may say, statistics have absolutely nothing to do with medicine, because it is easier to find two identical leaves than two similar

> human beings in terms of their constitution, their predispositions, their current malady, their susceptibilities and their reactions when being exposed to the same medicine.
>
> All my transfusions are different in terms of their causes, their doses, their reasons, their effects: I accept no arithmetic whatsoever and I do not answer to any demand for percentages.[64]

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Thus, we are still left in the dark about the medical evidence concerning the pros and cons of lamb blood transfusion. Did it work? There seemed to be no definite verdict, neither from the laboratory nor from the field.

But we should not forget the third condition for accepting or rejecting a therapy: its harm. Given the pain and uncertainty involved in a lamb blood transfusion, one may also legitimately ask: *Was it worth it?*

This question will be discussed in the next chapter.