# EXTRACTS FROM THE HISTORY OF THE ROYAL SOCIETY OF LONDON BY THOMAS BIRCH RELATING TO INFUSION AND BLOOD TRANSFUSION

## ROYAL SOCIETY – BACKGROUND

Following a lecture by Mr. (later Sir) Christopher Wren at a meeting held at Gresham College, London on the 28th November 1660 a 'nameless learned society' was formed whose members included such people as Robert Boyle and John Wilkins. The society secured the approval, encouragement and patronage of Charles II, who provided it with its first Royal Charter in 1662 and a second in 1663 when it became known as 'The Royal Society of London for Improving Natural Knowledge'.

See: https://royalsociety.org/about-us/history/

The 'Philosophical Transactions' began publication in 1665 under the editorial guidance of Henry Oldenburg, Secretary of the Royal Society, which is now the oldest scientific journal in continuous publication in the world. It is acknowledged to have established the concepts of scientific priority and peer review. As well as this publication, Henry Oldenburg was also responsible for maintaining the Society's minutes, letter-book and register book of their meetings. These were to become important early documents in that the *Philosophical Transactions of the Royal Society* was not started until March 1665, about four years after the Society's meetings commenced.

See: https://royalsocietypublishing.org/journal/rstl

## THE HISTORY OF THE ROYAL SOCIETY

The History of the Royal Society of London was compiled by Thomas Birch (1705-1766), Secretary to the Royal Society from 1752 to 1765, and was published in 1756-1757 as a supplement to the *Philosophical Transactions of the Royal Society*. It was later collected together into four volumes that can be viewed or download from the following sites:

Volume I:
https://books.google.co.uk/books?id=e2EVAAAAQAAJ&pg=PP9&source=gbs_selected_pages&cad=2#v=onepage&q&f=false

Volume II:
https://books.google.co.uk/books?id=lWEVAAAAQAAJ&pg=PP9&source=gbs_selected_pages&cad=2#v=onepage&q&f=false

Volume III:
https://books.google.co.uk/books?id=e2EVAAAAQAAJ&pg=PP9&source=gbs_selected_pages&cad=2#v=onepage&q&f=false

Volume IV:
https://books.google.co.uk/books?id=q2EVAAAAQAAJ&pg=PP11&source=gbs_selected_pages&cad=2#v=onepage&q&f=false

The ‘history’ actually comprises the minutes of sequential meetings of the Royal Society that are mainly identified as Council Meetings and Society Meetings, which together document a variety of issues including society business, nominations and appointments of new members, accounts, correspondence, as well as identifying the materials, documents and letters received by the Society. Initially at least, the general format of the Royal Society meetings is based on members bringing information, communications, details of unusual occurrences or objects and suggestions for possible interesting research to the attention of the members present who then discussed it and suggested possible experiments to extend or clarify the initial information. If agreed, then different members were asked to perform the suggested experiments, the results of which are presented to members at a future meeting. These experiments were not however always completed in the time frame requested; some being performed ‘in private’, i.e. by the researchers themselves, or ‘in public’, i.e. performed in front of the Society’s members and guests. In addition, some proposals for research are ‘lost within the minutes’, i.e. appear to have been forgotten, never performed / reported and as a result do not appear as a topic again at future meetings. It should be noted also that many of these reports lack experimental detail and are invariably reported in a subjective manner with little exact scientific information. In addition, many give only vague details and are invariably brief and lacking in concise detail. Some experimental results are acknowledged in the minutes but the report is identified to have been entered into the Register Book without giving further details.

## EXTRACTS RELATING TO INFUSION / BLOOD TRANSFUSION

All information relating to infusion or transfusion of blood has been extracted from the four volumes of the history and is presented below; the separate sentences / paragraphs (i.e. with a blank line between them) indicating separate but consecutive entries for that date. The entries are reproduced below as written, with the exception of altering the spelling of some Old English words and substituting the letter ſ which was used to represent the letter s, as well as changing the variable use of capital letters for some of the first names and/or surnames of people mentioned – otherwise the wording and punctuation is as printed. The dates for the first months of a year are frequently recorded as a ‘fraction’ of the previous and current year, i.e. the first entry in Volume II is dated 4 January $166^{4}/_{5}$, which was related to the civil or legal year in England that began on 25 March; these year dates have been recorded in the ‘new style’, i.e. 4 January $166^{4}/_{5}$ as 4 January 1665. Some entries include additional referenced information regarding the publication or recording of information – these have also been included. I have added notes and personal comments regarding some of the entries – these are presented in italics after the entry, as well as internet references and internet links to *Philosophical Transactions of the Royal Society* publications.

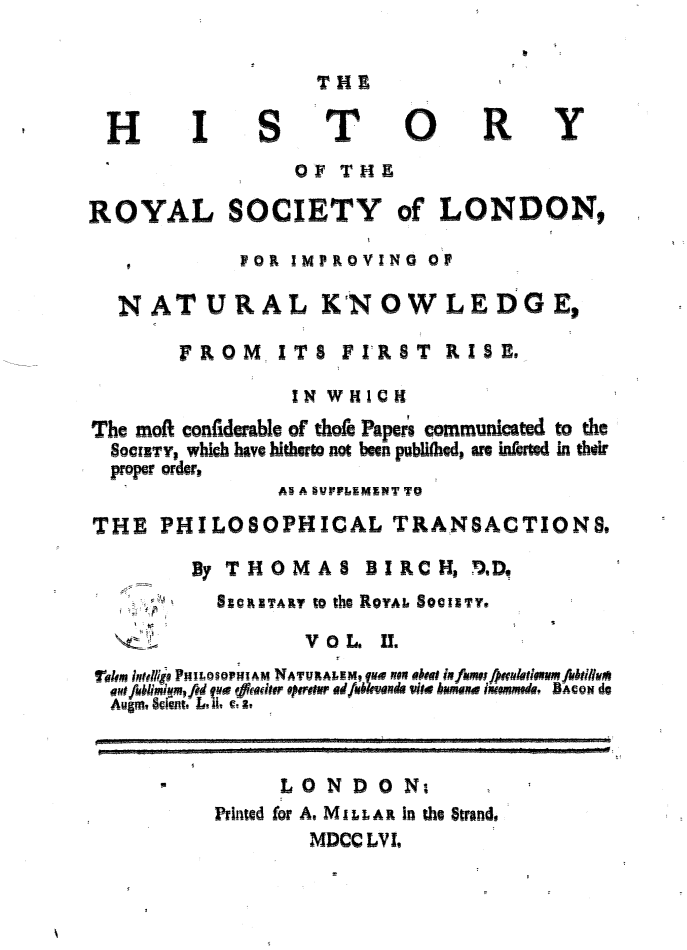
## SUMMARY

Volume I (2 January 1661 – 28 December 1664) contains five entries relating to the infusion of various substances into animals and the descriptions of their effects, performed by Dr. Timothy Clarke in England. This section does not include any information regarding the infusions performed in Europe at the same time or any information at all relating to the infusion of blood.

Volume II (4 January 1665 – 21 December 1671) contains a large number of entries and amount of information on the early aspects of blood transfusion experiments

performed in England and France, as well as some infusion experiments performed in England and Europe.

Volume III (11 January 1672 – 18 December 1679) and Volume IV (8 January 1680 – 14 December 1687) do not include any entries relating to blood transfusion.



THE

HISTORY

OF THE

ROYAL SOCIETY of LONDON,

FOR IMPROVING OF

NATURAL KNOWLEDGE,

FROM ITS FIRST RISE.

IN WHICH

The moſt conſiderable of thoſe Papers communicated to the Society, which have hitherto not been publiſhed, are inſerted in their proper order,

AS A SUPPLEMENT TO

THE PHILOSOPHICAL TRANSACTIONS.

By THOMAS BIRCH, D.D.

Secretary to the Royal Society.

VOL. II.

*Talem intelliga* Philosophiam Naturalem, *quæ non abeat in fumos ſpeculationum ſubtilium aut ſublimium, ſed quæ efficaciter operetur ad ſublevanda vitæ humanæ incommoda.* Bacon de Augm. Scient. L. ii. c. 2.

LONDON:

Printed for A. Millar in the Strand.

MDCCLVI.

Title page of the History of the Royal Society of London (Birch, 1756)
(Photo credit: books.google.co.uk)

## VOLUME I

*NOTE: The first full recorded meeting in this volume is 2 January 1661.*

**Page 25: 5 June 1661**

Dr. Clarke was requested to give in the narrative of his injection of liquors into the veins.

**Page 80: 9 April 1662**

Dr. Clarke related his injecting of a medicine made of an infusion of agaric* and senna into a dog's leg, which killed the dog.

** Agaric is a type of mushroom fungus fruiting body characterized by the presence of a cap that is clearly differentiated from the stalk.*

**Page 281: 22 July 1663**
Dr. Clarke being called upon for his trials of the injections into veins, promised to give them in a fortnight after.

*This report was actually given on the 16 September 1663 - see page 303.*

**Page 294: 19 August 1663**
Dr. Clarke was desired to bring in his experiments of injection, as they were then; and to make an addition hereafter of those, which he should try farther.

*This report was actually given on the 16 September 1663 - see page 303*

**Page 303: 16 September 1663**
Dr. Clarke read his experiments of the injections, which he had made of several liquors into the veins of dogs; and was desired to prosecute this subject; and the account brought in by him was ordered to be registered [1].

Several reflections were made upon this discourse of Dr. Clarke's, some observing, that anything thus injected, without preparation and digestion, into the veins, would make odd commotions in the blood, disturb nature, and cause strange symptoms in the body; others suggesting thereupon, that trials should be made with such liquors, as were prepared of such things, as had passed the digestion of the stomach, as spirit of urine, of hartshorn, of blood, &c. in order to see what effects would follow upon them. Some proposed the experiment, to let the blood of a lusty young dog into the veins of an old one, by the contrivance of two silver pipes fastened to the veins of such two dogs with a leather pipe between both to move the blood forward; by which means the extravasating of the blood might be avoided. Others added, that these injections would hardly serve for any medical uses; but perhaps by filling the vessels of an animal as full as they could hold, and by distending them exceedingly this way, new vessels might be discovered.

[1] It does not appear in the Register. Doctor Clarke's experiments are mentioned in the Philosophical Transactions, N° 7, p. 130, for Dec 4. 1665,* where it is remarked that he had made it part of his business to pursue the experiments of conveying liquors into animals of blood with much industry, great accurateness, and considerable observations thereon; which, above two years since, were by him produced and read before the Royal Society, who thereupon desired him, as one of their members, to complete what he had proposed to himself upon that subject, and then to publish the same.

** This reference is an editorial by Henry Oldenburg titled 'An account of the rise and attempts, of a way to conveigh liquors immediately into the mass of blood. Philosophical Transactions of the Royal Society, 1, 7, 128-130.*
*https://royalsocietypublishing.org/toc/rstl/1665/1/7*
*This paper emphasises that it was Christopher Wren who invented and practiced the infusion of materials directly into the veins of animals (though no actual date is given as to when the first experiment by him was performed) and that Mr. Boyle continued this type of investigation, publishing it in his book 'Usefulness of Experimental Natural Philosophy' (1663). The reference then mentions Dr. Timothy Clarke by name, stating: 'Since which time, it hath been frequently practised both in Oxford & London; as well before the Royal Society, as elsewhere. And particularly that Learned Physician, Dr. Timothy Clerk, [sic] hath made it part of his business, to pursue those Experiments with much industry, great accurateness, and considerable observations thereon; which above two years since, were by him produced and read before the*

*Royal Society, who thereupon desired him, as one of their members, to complete, what he had proposed to himself upon that subject, and then to publish the same: the effect whereof 'tis hoped, will now shortly appear, and not prove unwelcome to the curious.'*

*Dr. Timothy Clarke died in 1672 – the work referred to above being unpublished.*

*NOTE: There are no further entries relating to injections or blood transfusion in Volume I – the last meeting recorded in this volume taking pace on 28 December 1664.*

## VOLUME II

*NOTE: The first entry in this volume is dated 4 January 1665. There is no entry relating to transfusion before page 48.*

**Page 48: 17 May 1665**

It was suggested by Dr. Wilkins, that the experiment of injecting the blood of one dog into the vein of another might be made.

**Page 50: 24 May 1665**

Dr. Wilkins, Mr. Daniel Coxe, Mr. Thomas Coxe, and Mr. Hooke were appointed to take care of injecting the blood of one dog into the vein of another; and Mr. Thomas Coxe was particularly desired to try the changing of dog's skins.

Mr. Thomas Coxe related, that he had made an experiment of injecting the blood of one pigeon into the vein of another, by opening the vein of one, and letting it bleed, till the pigeon was almost expiring; and then letting out the blood of another pigeon, and injecting it into the dying one, and thereby keeping it alive for half an hour, after which it died, as the other pigeon did, though a pretty while after.

*Note: The grafting of the skin of a dog had been mentioned in previous meetings and is mentioned again on page 98.*

*On page 51, within the section of the minutes of this meeting titled: 'The following experiments were appointed for the next meeting', the sixth entry is 'To try the injecting of the blood of one dog into another.'*

**Page 54: 31 May 1665**

It was ordered, that the experiment of injecting the blood of one dog into another be tried at the next meeting; upon which occasion Dr. Crouse suggested, that a common pipe might be used for both, in order to have thereby the blood of one dog sucked out by the other.

**Page 54: 7 June 1665**

Dr. Wilkins made a report of an experiment committed to his care, viz. that a dog's belly had been opened, and out of the vena cava there was let blood to the quantity of 5 or 6 ounces into a bladder, having a small pipe of brass fastened to it in the manner of a clyster-pipe, the end of which being put into the crural vein of a bitch,

there was, by pressing the said bladder, about two ounces of blood injected into that vein, but without any sensible alteration in the bitch: …

This experiment was attested by Sir William Petty, Mr. Willughby, Mr. Daniel Coxe, and Mr. Hooke, who had been present at the making it .

*The 'bladder, having a small pipe of brass fastened to it in the manner of a clyster-pipe' formed a type of syringe that had been used earlier by Wren for intravenous infusion of medicaments.*

**Page 65: 14 March 1666**
*Note: Under the entry: 'After above eight months interruption, occasioned by the public calamity of the plague, the Society opened their meetings again upon a summons sent out by the president, as it had been ordered at their last meeting, June 28, 1665' are the following entries:*

**Page 67**
Dr. Clarke being called upon for his history of the injection into the veins, gave answer, that he had not neglected it, and intended to finish it, as soon as possibly he could, for the press. *

Sir Robert Moray took hence occasion to speak of the transfusing of the blood of one animal into another, attempted by Mr. Boyle, as a considerable experiment, if it could be practised.

Dr. Clarke affirmed, that above two years before he had endeavoured to make that experiment, but found it so difficult, that he gave it over. **

* *Dr. Timothy Clarke died in 1672 – the work referred to being unpublished.*
** *Given the assumption that the person referred to is actually Dr. Timothy Clarke (he is referred to within the minutes for 14 March 1666 only as Dr. Clarke) this comment may indicate that this attempt was part of his infusion experiments (see the meeting of 16 September 1663, Volume I, page 303). This entry, as well as Henry Oldenburg's editorial regarding infusion experiments published in the 4 December 1665 issue of Philosophical Transactions of the Royal Society (Vol. 1, Issue 7, p. 128-130), does not identify that Dr. Clarke attempted to perform a blood transfusion between two animals. This comment cannot therefore be confirmed as there is no other published record of this 'failed attempt'.*
*https://royalsocietypublishing.org/toc/rstl/1665/1/7*

**Page 68**
Sir Robert Moray intimated that Mr. Boyle was of opinion, that the difficulties of this experiment might be mastered.

**Page 83: 18 April 1666**
He [*Mr. Boyle*] being desired to inform the Society, what success he had had in the experiment of transfusing blood out of one animal into another, declared, that he had found so much, as made him hope, that the difficulties, which to some appeared therein, might be surmounted; and that he thought, that the experiment, which he had made of it, would have proved a good one, if the syphon had not broke.

Dr. Charlton observed, that if the fluidity and life of the blood depended upon the ferment vitality with or in the vessels, which ceased presently upon its being

extravasated, the experiment would prove useless: but that if the course and vigour of the blood was impaired only by the external air, that might easily be prevented.

Mr. Boyle being desired to prosecute this experiment, declared, that he thought Dr. Lower would do so at Oxford.

**Page 84**
He [*Mr. Boyle*] related, that being once desirous to try, whether a dog might be fed by injection, he injected some quantity of broth into the jugular vein; but that this dog soon after died, and being opened, the broth was found in the right ventricle of his heart. He observed therefore, that it would be better to try by injecting broth into the crural vein, as being at a greater distance from the heart.

Dr. Charlton mentioned, that purges given by injection had no effect; but vomits had, and that quickly.

Mr. Boyle added that opiates given this way operated likewise presently; which Dr. Charlton confirmed.

**Page 98: 20 June 1666**
Dr. Wallis, upon the motion of Mr. Boyle, related the success of the experiment made at Oxford by Dr. Lower, of transfusing the blood of one animal into the body of another, viz. that having opened the jugular artery of a mastiff, and injected by the means of quills the blood thereof into the jugular vein of a grey-hound; and opened also a vein in the same grey-hound to let out so much of his blood, as was requisite for the receiving that of the mastiff, the mastiff at last died, having lost almost all his blood, and the grey-hound having his vessels closed, survived and ran away well. *

Mr. Boyle was desired to procure from Dr. Lower a full description of the method used by him in the performance of this experiment, and to let him know, how acceptable it would be to the Society, to receive such an account, they having a design to get the experiment made before them.

Mr. Boyle was likewise desired to engage Dr. Lower in the making of the experiment of changing a dog's skin. **

**According to an entry in 'Tractatus de Corde', Lower states that 'towards the latter end of February 1665, this method of transfusion was first brought to perfection by me' (p. 188)*
*** This was first suggested by Mr. Thomas Coxe at the meeting on 24 May 1665 (see page 50). There is no other entry related to this experiment or indeed anything related to the grafting of skin.*

**Page 115: 26 September 1666**
There was read a description of the method of transfusing the blood of one animal into another, as it had been practised with success at Oxford by Dr. Richard Lower; which description was communicated by him in a letter to Mr. Boyle.* It was ordered to be registered [h], and Mr. Daniel Coxe, Mr. Thomas Coxe, Mr. King, and Mr. Hooke were appointed to be curators of this experiment, first in private by themselves, and then, in case of success, in public before the Society; and Dr. Goddard, Dr. Merret, Dr. Clarke, Dr. Croune, and Dr. Balle were desired to be present at the experiment.

[h] Register, Vol. iii. p. 159. It is printed in Philosoph. Transact. Vol. i, N° 20, p. 353, for December 1666.
https://royalsocietypublishing.org/toc/rstl/1666/1/20

** Richard Lower records in his book 'Tractatus de Corde' that Robert Boyle's letter to him is dated 26 June 1666 and his letter back to Robert Boyle is dated 6 July 1666. However, 'The Works of the Honourable Robert Boyle' (Vol. 5, p. 528) contains a letter from Richard Lower dated 3 September 1666 which describes his artery-to-vein transfusion method in detail. Given the proximity of dates it appears very likely that this comment relate to this letter.*

**Page 117: 24 October 1666**
It was ordered, that the committee appointed before for the experiment of bleeding one dog into another do meet on the Friday following about two o'clock in the afternoon in Dr. Pope's lodgings to make that experiment: as also, that the experiment be afterwards made before the Society, in case it should succeed in private; in reference to which Dr. Lower's paper, about the method to be observed therein, was delivered to them.

*The 'committee appointed' presumably means Mr. Daniel Coxe, Mr. Thomas Coxe, Mr. King, and Mr. Hooke (who were previously identified as the 'curators of this experiment' – see page 115). The 'Friday following' the 24 October meeting, which according to Samuel Pepys was a Wednesday, is therefore the 26 October 1666. However, the comment made at the next Society meeting on 31 October (page 118) would appear to indicate that this experiment did not actually occur on the 26 October, or may have been performed but was unsuccessful – there is no information to support either option.*

**Page 118: 31 October 1666**
It was ordered, that the experiment of bleeding one dog or one sheep into another dog or sheep be made on the Tuesday following in the morning by the committee appointed before for that purpose.

*This request is a repeat of that given at the previous society meeting on the 24 October 1666. According to Samuel Pepys the 31 October was a Wednesday and therefore the 'Tuesday following' must have been the 6 November 1666. This experiment must have presumably been performed and was successful but was not demonstrated at the next Society meeting on the 7 November, being performed in public at the Society meeting on the 14 November 1666 (see page 123) and described on 21 November 1666 (see page 125). Note is made by Dr. King within his report that the 'private' transfusion had been made between two sheep and not two dogs (as originally requested by the committee). The date when the transfusion between two sheep occurred is therefore incorrectly identified by Paul Scheel in his book 'Die transfusion des blutes und einspreutzung der arzeneyen in die adern' (1802) when he states that it was performed on 5 November 1666 (see section §.21).*

**Page 123: 14 November 1666**
The experiment of transfusing the blood of one dog into another was made before the Society by Mr. King and Mr. Thomas Coxe upon a little mastiff and a spaniel with very good success, the former bleeding to death, and the latter receiving the blood of the other, and emitting so much of his own, as to make him capable of receiving that of the other.

It was ordered that the whole method and all the particulars of the operation, should be fully described by the curators of this experiment, and brought in at the next meeting.

**Page 125: 21 November 1666**

A paper communicated by Mr. King was read, giving an account of the method and success of the late experiment of transfusing the blood of one dog into another; which was ordered to be registered [o], as follows:

"In obedience to your commands, we tried this experiment; first by ourselves upon two sheep, viz. Having tied them, and placed them in a convenient posture, we laid bare the carotid artery of the one sheep, near two inches, dividing from it the nerve of the eighth pair; then we made a ligature upon the upper part of the artery (next the head) and tied a false knot; which done, we made another ligature upon the other end next the clavicle, with a riding-knot; then we made an opening on this side of the riding-knot, at a convenient distance, and put in a brass pipe, and tied it fast in, the which pipe was stopped very close, and brought over the skin again till we had prepared the other sheep, as follows, viz. We laid bare the jugular vein about the same distance as before, a rather more, and made a ligature at either end, with a riding-knot; then on this side of each knot (having made apertion) we put in a brass pipe, both tied very fast in, and close stopped. Then we ordered the position of the sheep, so as we might conveniently plant other pipes (which were of quills) to convey the blood from the artery of the one sheep to the vein of the other, which does immediately flow, upon the slipping of the riding-knots, the recipient sheep being placed a little lower than the emittent, and the position kept steady. Then we presently slipt the riding-knot also of the upper part of the jugular vein, and received blood from thence, proportionably to what was admitted into the lower part of it, or near it: We did take away by the upper part of the vein between four and five pints according to guess; about which time the emittent grew faint, which made the owner very earnest to kill it the usual way; which he did, but could not get half a pint of blood, and upon opening the same sheep, confessed, he never saw mutton look whiter in his life. The other sheep, which was the recipient, seemed as well as if she had been unconcerned in the experiment. We staid also to see her killed too, and she bled at the rate as is usual, and as much in quantity."

"We repeated the same experiment the last Wednesday before the Society, upon a small bull-dog and a spaniel, much after the same manner, as many of you were eye-witnesses: only we were more exact in the performance, by letting the mastiff bleed into the spaniel till the mastiff died: And we took account, as near as we could, by weighing the blood taken from the spaniel, which we reckon was sixty-four ounces or thereabouts. The spaniel was next morning very well and brisk, and so continues."

It was ordered, that the experiment of exchanging the blood of animals be prosecuted and improved by bleeding a sheep into a mastiff, and a young healthy dog into an old and sick one, & vice versa; and that Mr. King be desired to continue his assistance therein.

The spaniel, which in the late experiment had received the blood of a bull-dog, was produced and found very well.

[o] Register, Vol. iii. p. 167.

*This entry therefore confirms that Mr. King, presumably together with others (who are identified on 26 September 1666 to be Mr. Daniel Coxe, Mr. Thomas Coxe and Mr. Hooke), performed a transfusion between two sheep 'in private' on 6 November 1666 (see comment above) and between two dogs 'in public' on 14 November 1666.*

**Page 132: 4 December 1666 [Council Meeting]**
As to the experiments of transfusion there were suggested several: to try mutual transfusion between old and young, sick and healthy, and that both of the same and of different species. In particular it was suggested, that it should be tried upon a mangy and a sound dog, a young and an old horse; and upon a diseased horse and an ox or cow, to bleed the cow, to be killed, into such a horse.

*The suggestion of transfusing blood from a 'sound dog' into a 'mangy dog' is mentioned again at the meetings on 12 December 1666 (page 133) and 19 December 1666 (page 134). The experiments however appear to have been delayed due to the cold weather that is stated as 'causing more coagulation in the blood' (see the meeting on 12 December 1666 – page 133) and subsequently suggested (see the meeting on 2 January 1667 – page 137) that because of this, these experiments are delayed until 'the summer weather came in'.*

**Page 132: 5 December 1666 [Society Meeting]**
Mr. Boyle promised to communicate at the next meeting the particulars, which he had thought upon for the prosecuting and improving the experiment of bleeding animals into one another.*

It was desired also, that others would consider the importance of this experiment, and suggest things to be tried accordingly.

** These thoughts were included within a paper by Robert Boyle, i.e. 'Trials proposed by Mr. Boyle to Dr. Lower, to be made by him, for the improvement of transfusing blood out of one live animal into another', published in Philosophical Transactions of the Royal Society (11 February 1667), 1, 22, 385-388.*
*https://royalsocietypublishing.org/toc/rstl/1667/1/22*

**Page 133**
[*One of*] The experiments appointed for the next meeting were:
1. The bleeding of a sheep into a dog; the curators of which were to be Dr. Pope, Dr. King, Mr. Coxe, and Mr. Hooke, who were to perform it first by themselves in private.

**Page 133: 12 December 1666**
The experiment, which was ordered of bleeding a sheep into a dog of the kind of curs was made; which succeeded pretty well, though not so well as that, which had been made at the meeting of November 21,* by reason, as it was supposed, of the frosty weather causing more coagulation in the blood. In the mean time Dr. King reported to the Society, that on the Monday before, the like experiment had been tried in private with very good success, at which were present Dr. Pope, Mr. Daniel Coxe, Mr. Thomas Coxe, Mr. Oldenburg, and Mr. Hooke. **

It was ordered, that at the next meeting this experiment should be tried upon a mangy and a sound dog, letting the blood of the former into the veins of the latter;

and that Dr. Balle, Mr. Daniel Coxe, Mr. Thomas Coxe, and Mr. Hooke should take care of the experiment. ***

Mr. Boyle moved, that the animals might be weighed before the operation; and that the transfusion, made in so short a time as that work lasted, could not be considerable.

** This is confusing in that the date of the 21 November relates to the reporting of the public 'experiment of transfusing the blood of one dog into another' (see page 125) that actually occurred on the 14 November (see page 123). Neither date relates to the bleeding of a sheep into a dog.*
*** Given that Samuel Pepys identifies the 12 December 1666 to be a Wednesday, the 'Monday before' this meeting indicates that the successful 'private' experiment must have been performed on 10 December 1666 – repeated with apparent less success in public at the Society meeting on 12 December 1666.*
**** This experiment was originally proposed, along with others, at the Council Meeting on 4 December 1666 (see page 132)*

**Page 134: 19 December 1666**
It was ordered, that at the next meeting the experiment be made of transfusing the blood of a sound dog into a mangy one; and that the operator provide necessaries for it, to begin the operation about twelve o'clock that day. *

Mr. Boyle suggested that it might be considered to make an estimate of what proportion of blood is let out. **

Dr. Pope moved, that a trial might be made of letting out half the blood of a dog, and of supplying it with warm milk, or, because milk may coagulate, with a liquid of barley-cream. ***

Mr. Boyle mentioned, that not only care must be had of the kind of liquor to be injected, but also of the manner and place of the injection; in default whereof the liquor would drive the blood before it to the heart, and by too great abundance crowding in there kill the animal. To avoid which, it might be injected by degrees, and in the remoter parts from the heart, as in a crural vein.

Dr. Goddard moved to try the bleeding of a dog almost to death, and to let in blood again, to see whether he might be restored that way.

** This was suggested at the meeting on 12 December 1666 (page 133). It did not happen 'at the next meeting' (which took place on 21 December), but was postponed due to the cold weather, being performed on the 21 March 1667 – see page 161.*
*** Boyle had made this suggestion previously, at the meeting on 12 December 1666 (see page 133), the volume being estimated by accurately weighing the animal before and after the transfusion.*
**** The injecting of 'sugared milk' is also referred to on 4 April 1667 (page 164)*

**Page 137: 2 January 1667**
It was ordered, that the experiments of transfusing blood be prosecuted, when the summer weather came in.

*It was suggested in the minutes of the meeting of 12 December (page 133) that the frosty weather causes 'more coagulation of the blood'. This unsupported comment therefore delayed any further experimentation for nearly three months.*

**Page 161: 21 March 1667**

He [*Mr. Thomas Coxe*] affirmed, that he had made the experiment of transfusing blood upon a mangy dog and a sound dog, by opening a vein in each of them; and that he had found, that the sound dog was not infected thereby, and the mangy dog was cured. *

Mr. Oldenburg produced an account, which he had received from Paris, of the success, which the curious had met with there in the same experiments, viz. that they had so tried it, as that the same blood had been in three dogs within the space of six days; one of the animals having been a bitch big with puppies, which some time after the operation had cast one whelp dead, having not above three or four drops of blood in its whole body.

It was ordered, that at the next meeting this kind of experiments should be resumed; and Dr. King was desired to perform the operation by letting most of the blood of a dog run out before any other was infused; and that then he should be recruited by the blood of a sheep. **

** No date is recorded in the minutes as to when this experiment took place, though it must obviously have been performed prior to 21 March 1667, the date that it is reported. The experiment by Mr. Thomas Coxe 'An account of another experiment of transfusion, viz. of bleeding a mangy dog into a sound dog' was subsequently published in Philosophical Transactions of the Royal Society (6 May 1667), Vol. 2, Issue 25, p. 451-452.*
*https://royalsocietypublishing.org/toc/rstl/1667/2/25*
*Note: This report does not necessarily attribute the loss of blood from the mangy dog as being directly related to its cure, as reported by some authors, as the final paragraph of the report (reproduced below) actually identifies that the mangy dog was cured in 10-14 days from the 'considerable evacuation' it made, which may indicate something other than loss of blood, i.e. "The effect of which experiment was, no alteration at all, any way, to be observed in the sound dog. But for the mangy dog, he was in about 10 days or fortnight's space perfectly cured: which might with probability enough, I think, have been expected from the considerable evacuation, he made, (perhaps the quickest and surest remedy for the cure of that sort of disease, he was infected with, both in man and beast.)"*
*** This comment supports the rivalry regarding scientific priority between the people performing transfusion experiments at that time in England and France*

**Page 162: 28 March 1667**

An experiment was made, by Dr. King's operation, of bleeding a sheep into a spaniel dog, so as fifteen ounces of the dog's blood being first let out, before any supply of other blood was given, there were afterwards transfused into him out of the sheep thirty-six ounces at least, which was computed by the time of bleeding, measured by a minute watch; by which it appeared, that in the space of four minutes seventeen ounces of blood, at least, had been let run into the dog out of the sheep; since the sheep being afterwards suffered to bleed into a dish for the space of eight minutes, the blood let out in that time weighed about thirty-six ounces; during which time the blood must be supposed to have run slower than it did before, when it was suffered to run into the dog. *

Dr. King was desired to give in a full account of this experiment at the next meeting, in order to its being registered.

Mr. Boyle moved that some animals might be bled to death, to see what quantity of blood they contained. Upon which the operator was ordered to provide a dog for the next meeting, to let out all his blood.

Mr. Thomas Coxe brought in writing the relation, which he made at the last meeting, of the experiment of transfusing the blood of an old mangy dog into a sound dog, whereby the former was cured, and the latter not infected. It was ordered to be registered. [p]

[p] Register, Vol. iii. p. 193. It is printed in the Philos. Transact. Vol. ii, Nº 25, p. 451, for May 1667
https://royalsocietypublishing.org/toc/rstl/1667/2/25

** This 'public' transfusion was the second time that Dr. King had transfused the blood of a sheep into a dog – the first having been 'in private' on what is believed to have been on 10 December 1666 (see page 133). Mr. Boyle made the suggestion of calculating the volume of blood transfused by accurately weighing the animals before and after transfusion, i.e. on the 12 December 1666 (page 133) and although he subsequently suggest it on the 19 December 1666 (page 134) his comment lacks detail as to how this should be performed. This entry indicates that the estimated volume transfused was in fact made by measuring the 'rate of flow' of blood from the donor animal over time (given the recognised limitations that it would have slowed during the process).*

**Page 164: 4 April 1667**

Dr. King brought in an account in writing of two experiments made at his own house by himself, assisted by some friends of his; one of which was the bleeding of a calf by a vein into the vein of a sheep; the other of injecting sugared milk into the vein of a dog, after the emission of eighteen ounces of his blood: Which experiments were ordered to be registered [t].

[t] Register-Book, Vol, iii, p. 185; This account is printed in the Philos. Transact. N° 25, p. 449, for May 1667.
https://royalsocietypublishing.org/toc/rstl/1667/2/25

*The reference given for 'these experiments' (Philosophical Transactions of the Royal Society, 6 May 1667, Vol. 2, Issue 25, pages 449-451) is confusing in that this report actually provides a account of two separate (vein-to-vein) transfusions performed by Dr. King, both of which are from a calf to a sheep. The first is presumably the one referred to in this report, the second being the one reported by Dr. King at the meeting on 18 April 1667 (see page 167). This published report does not include the injection of sugared milk into the veins of a dog. Although reported here on the 4 April, no date is identified when Dr. King's first calf to sheep transfusion experiment actually took place (though this may be stated in his actual written account held in the Register Book), whilst the second calf to sheep transfusion appears to have taken place on the 15 April 1667 (see page 166).*

*A report of Dr. King's 'sugared milk' infusion experiment is requested at the meeting on 11 April 1667 (see page 167) and was given by him on 18 April 1667 (see page 167), where it is identified that having bled a dog of eighteen ounces of blood, it was*

*injected with a similar volume of 'milk and sugar' and that the dog had died. Note: This experiment was originally suggested by Dr. Pope on 19 December 1666 (see page 134).*

**Page 165**
It was likewise ordered, that at the next meeting an experiment be made of letting out the blood of a dog, both by a vein and artery, at one and the same time, out of vessels equally distant from the heart, as out of the jugular vein and a jugular artery; and that the operator provide a dog for that purpose.

That another such experiment be made, as Dr. King had given at this meeting an account of; and that the recipient sheep be turned to graze again. *

** Although both transfusions performed by Dr. King involving bleeding a calf into a sheep reported in Philosophical Transactions of the Royal Society on 6 May 1667 were successful, the first sheep recipient is stated to have been bled to death (to see how much blood it actually contained) whereas the second sheep was allowed to live 'being sent to grass again' – hence this comment.*

**Page 166: 11 April 1667**
Sir George Ent moved, that a dog might be bled almost to death, and then the blood of another dog transfused into him, to try to recover him.

The operator was ordered to have dogs ready at the next meeting for that purpose.

He was likewise ordered to be at Dr. King's house on the Monday following at two in the afternoon, for repeating the experiment of bleeding a calf into a sheep by a vein, which being done, the sheep should be kept alive and turned to grass again.

*According to Samuel Pepys, the 11 April 1667 was a Thursday; therefore the 'Monday following' this date, when this repeat experiment of the transfusion of a sheep from a calf, can be identified to have taken place on the 15 April 1667. This transfusion is the second one of the two described in the report published in Philosophical Transactions of the Royal Society, 6 May 1667 (Vol. 2, Issue 25, pages 449-451).*
*https://royalsocietypublishing.org/toc/rstl/1667/2/25*
*It is subsequently identified by Dr. King at the Society Meeting on the 6 June 1667 (page 180) that the sheep 'after three weeks time fell sick, pined away, and died'.*

**Page 167**
It was ordered, that Dr. King be desired to give a further account in writing of the experiment, which he had made in private of injecting eighteen ounces of milk and sugar into a dog, from which he had taken as many ounces of blood, whether the dog lived or not.

[Mr. Thomas Coxe put in mind …] That a dog be bled both by a vein and artery at one and the same time; and that the differences of the arterial and venal blood be more particularly considered than had been before done.

**Page 167: 18 April 1667**
Dr. King brought in a written account of his concerning the second experiment made by himself in private upon a sheep and a calf, by transfusing the venal blood of the latter into the vein of the former, turning the sheep, after the operation, to grass

again: and another written account of his containing some farther observations made by him upon a dog, into whose veins he had injected a quantity of sugar'd milk, after the letting out of him the like quantity of blood: both which accounts were ordered to be registered [a].

Dr. King having mentioned, that the dog, which had the sugar'd milk injected into his veins, had stunk before he died, Mr. Boyle moved, that this experiment might be tried again, to see whether the like effect would follow.

Dr. Crouse moved (what had formerly been suggested by Mr. Boyle) that a purging medicine might be given to the emittent dog before the operation, to see, whether the recipient dog would be thereby purged; and how?

The experiment of letting a dog bleed almost to death, and then transfusing into him the blood of another dog, was deferred till another meeting.

[a] Register, Vol. iii, p. 187 - 189, and 192. See Philos. Transact. N[o] 25, p. 451.

*This Philosophical Transactions of the Royal Society reference is incorrect in that pages 451-452 refer to the transfusion of blood from a mangy dog into a sound dog by Thomas Coxe and not Dr. King's two separate (vein-to-vein) blood transfusions each from a calf into a sheep, the correct reference for which is Volume 2, Issue 25, pages 449-451.*
*https://royalsocietypublishing.org/toc/rstl/1667/2/25*

*Although 'registered' there is no published written report by Dr. King of the injection of sugared milk into a dog other than the report to the Society on the 4 April and subsequently at this meeting on the 18 April 1667.*

**Page 172: 2 May 1667**
Dr. King's paper giving an account of an experiment made by him upon a mangy dog was read, and ordered to be registered [o]. *

He was desired to try the transfusion of the blood of a dog or fox into a sheep or lamb.

[o] This paper does not appear in the register.

** This comment is rather confusing in that Mr. Thomas Coxe is identified to have performed the blood transfusion from a mangy dog into a sound dog at the meeting on 28 March 1667 (see page 162) and not Dr. King. The experiment by Thomas Coxe is published in Philosophical Transactions of the Royal Society, Vol. 2, Issue 25, pages 451-452.*
*https://royalsocietypublishing.org/toc/rstl/1667/2/25*
*Given that this paper does 'not appear in the register' may indicate that this is not an accurate entry.*

**Page 179: 6 June 1667**
Dr. King gave an account of the experiment lately made by himself of transfusing the blood of a dog into a sheep, the sheep being very sick upon it, but somewhat relieved by taking away some of her blood; it being thought, that she had received too much blood from the dog. He was desired to give this account with all the circumstances in writing.

*A report of this experiment is presented by Dr. King at the meeting on 25 July 1667 (see page 189)*

**Page 180**
He related likewise, that the sheep, into which formerly the blood of a calf had been transfused, and which was, after the experiment, turned to grass, after three weeks time fell sick, pined away, and died.

He was desired to repeat this experiment at his conveniency, and to send the sheep, on which the experiments were made, to Kensington to Mr. Henshaw's house, who was desired to permit them to graze in his ground; which he promised to do.

**Page 189: 25 July 1667**
Dr. King brought in writing an account of several experiments made by him, viz. 1. Of bleeding a dog into a sheep. 2. Of a lamb into a fox, with some queries upon the same. [*Note: This report includes five other non-transfusion experiments*] All these several experiments [*by Dr. King*] were ordered to be registered [r]…

[r] Register, Vol iii, p. 194.

**Page 190 and 191**
"May 30, 1667. 1. Having prepared a sheep and a dog for the experiment of transfusion, I took away blood from the sheep till she grew faint; then I supplied her with dog's blood, till she was extreme sick, and, as we judged, had received as much, if not more blood than she lost. Then we set her upon her legs, but she would not endure that posture, but lay down in such an agony, that we all feared she would die; and in regard we heard a violent clapping of the diaphragm, we were apt to think she was over stocked with dog's blood, which made us resolve to let her blood, ten or twelve ounces, which we did, and the diaphragm presently ceased that vigorous clapping we heard before, and she took her breath much more freely; yet remained sick, and to continued two or three hours, but by the next morning was reasonably well, and did eat hay: So I sent her to grass, and she eat and seemed well six or seven days, but did not care to accompany with any other sheep; but in three or four days more droopt, and died. But by what I hear, her neck was ill looked to, and tainted, by reason of the heat of the weather and the injury of the flies."

"I think it not amiss, to tell you, that a great part of this blood was transfused from the dog's vein first, but with six times the trouble and pains I ever had before in this kind of experiment. The reason I take to be this: the day before the experiment was made, the dog had lost one of his jugular veins in another experiment I had not time to finish; and I happened to prepare the dog's other jugular vein first, which being done, both the external jugulars were useless to him; which put him into so great a disorder, that we feared he would have died before the sheep could be made ready to receive his blood; and when we came to bleed him into the sheep, he bled freely a good while, but afterwards the blood was more apt to coagulate, than I had seen it; insomuch we were forced to open an artery to finish the experiment. Perchance the blood staying so long, as it were, imprisoned, did tend to coagulation before transfusion."

"June 9 1667. 2. I prepared a fox and a lamb for transfusion; the fox was but small and very poor, so that I durst not take above five ounces at first, before he had received some: then I bled the lamb into him, till he was extremely short winded; then for fear of suffocation, I stopped the current of lamb's blood, and perceiving the fox to

continue very sick and short-winded, I took out about four ounces of blood more, of a much more florid colour, than the fox's own blood was, before it was mixed. After that we fancied him fainter than before, and bled into him again, till we thought him incapable of receiving more without danger. But he continued very sick, as curst as before, and more apprehensive of being molested, a little after, than he was; and forsook all things he was used to eat or drink; yet if a stick was held to him, he would bark and snap at it with great fury: but after twenty-four hours, he fell into a great trembling and grew faint, and died, and had some blood come out of his nose when dead. Yet I think his vein was prepared with as little trouble as any has been in any kind of experiment. Mr. Boyle did me the honour to be present at this experiment."

"Since I wrote this, I opened the fox, and contrary to expectation found the thorax and abdomen half full of bloody water, or rather blood, and all the vessels very turgid, and the very coats of the intestines seemed inflamed: so that I believe there was much more blood put in, than was taken out, though we did not think so. Perhaps the consideration of this great quantity of blood, found in the thorax and abdomen, may prove worth the experiment; viz.

1. Whether the lamb's blood did so alter the quality and consistence of the fox's blood, as to make it more thin and fine; and so consequently make his spirits more apt to fly away, whereby the tone of the vessels might be much injured either by a relaxation, or by a different heat; either of which perhaps may weaken retention?
2. Which may be more probable, whether (the veins being over full) the arteries did not force out this blood at their own extremities, the veins not being able to receive it?
3. Whether the great turgency of both veins and arteries did not bereave them of tightness and retention?

*The report of the second transfusion experiment from a lamb to a fox does not identify if it was a vein-to-vein or artery-to-vein transfusion, though Paul Scheel in his 1802 book 'Die transfusion des blutes und einspreutzung der arzeneyen in die adern (see section §.30) comments: 'from the fact that the fox's blood became redder from it, one might conclude that it came from an artery'. However, Dr. King had previously published his paper on vein-to-vein transfusions (Philosophical Transactions of the Royal Society, Vol. 2, Issue 25, p. 449-451)*
*https://royalsocietypublishing.org/toc/rstl/1667/2/25*
*He also later though provides a letter relating to a possible human transfusion using an artery-to-vein method that is contained within Henry Oldenburg's editorial titled: 'An account of more trials of transfusion, accompanied with some considerations thereon, chiefly in reference to its circumspect practice on man; together with a farther vindication of this invention from usurpers', published in the Philosophical Transactions of the Royal Society, Vol. 2, Issue 28, pages 517-522.*
*https://royalsocietypublishing.org/toc/rstl/1667/2/28*

**Page 201: 17 October 1667**
Mr. Oldenburg moved that the experiment of transfusion of blood might be prosecuted and considered, in order to try it with safety upon men, it having been already practised at Paris. This was recommended by the president to the consideration of the physicians.

The experiment appointed for the next meeting, upon the suggestion of Mr. Hooke, was that of making the blood of an animal pass from one side to the other out of the

vena arteriosa into the aorta, without passing through the lungs. Dr. Lower and Mr. Hooke were desired to take care of this experiment.

*This comment identifies that Oldenburg was obviously aware of the transfusions made by Jean Denis in France in June and July 1667. Jean Denis's letter 'A letter concerning a new way of curing sundry diseases by transfusion of blood, written to Monsieur de Montmor, Councellor to the French King, and Master of Requests', was published in the 23 September 1667 edition of the Philosophical Transactions of the Royal Society, Vol. 2, Issue 27, p. 489-504.*
*https://royalsocietypublishing.org/toc/rstl/1667/2/27*

**Page 202**
The method of transfusing blood into a man, as it was contrived by Dr. King was read, and ordered to be registered [h].

It being moved, that the experiment might be made accordingly, as it had been done already in foreign parts, Sir George Ent suggested, that he thought it most advisable to try it upon some mad person in the hospital of Bethlem. This being seconded by divers other physicians of the Society, Dr. Lower, Dr. King, Mr. Thomas Coxe, and Mr. Hooke were desired to speak with Dr. Allen, physician to Bethlem, about the execution of this trial, and to let him know the opinion declared in the Society concerning it; which they undertook to do.

[h] Register, Vol. iii, p. 205. It is printed in the Philos. Transact. N° 28. p. 522.

*The Philosophical Transactions of the Royal Society reference given here is incorrect, i.e. it should be Vol. 2, Issue 28, pages 517-522, which is a report by Henry Oldenburg titled: 'An account of more trials of transfusion, accompanied with some considerations thereon, chiefly in reference to its circumspect practice on man; together with a farther vindication of this invention from usurpers'.*
*https://royalsocietypublishing.org/toc/rstl/1667/2/28*
*In this report, Oldenburg essentially discusses various priority issues between England and France related to both infusion and blood transfusion, one of which involves the transfusion of a man, which Oldenburg argues would have been performed in England if the English 'had not been so tender in hazarding the life of man (which they take so much pains for to preserve and relieve) nor so scrupulous to incur the penalties of law'. Dr. King is mentioned in regard to this as follows (corrected here for the original Old English spelling): 'The publisher can assert bona fide, that several months ago he saw himself the instruments ready, and heard the method agreed on, thought proper to execute this operation upon man. And, for further proof thereof, he shall here insert the whole way, peculiarly contrived here for this purpose, by the ingenious Dr. Edmund King, and by him communicated in a letter; Monsieur Denys not having thought fit to describe the manner they used in France for men, nor any body else, come to our knowledge.' The article includes a letter by Dr. King which (corrected for Old English) is as follows,*

*Sir,*
*Method of transfusing blood you have seen practiced, with facility enough, from beast to beast; and we have things in a readiness to transfuse blood from the artery of a lamb, kid, or what other animal may be thought proper, into the vein of a man. We have been ready for this experiment for these six months, and wait for nothing but good opportunities, and the removal of some considerations of a moral nature. I gave you a view, you may remember, a good while ago, of the instruments, I think very proper for the experiment, which are only a silver tube, with a silver stopper somewhat blunted at one end, and flatted at the other for convenience of handling,*

*used already upon beasts with good success. The way is short this. After the artery is prepared in the lamb, kid, etc, a ligature be made upon the arm etc, of a man (hard enough to render the vein turgid) in the place, you intend to insert the lesser end of the silver pipe, which is so fitted, that the silver stopper, thrust into the tube, reaches somewhat, by its blunt end, beyond one of the ends of that tube. This done, divide the skin of the part in the same manner, that is used in cutting an issue, just over the vein, to be opened. Then with a fine lance open the vein; or, if you please, in case the vein lies fair and high (especially if the skin be fine) you may open both together, according to the usual way of letting blood. Which done, let an assistant clap his finger, or a little bolster, prepared beforehand, or the like, upon the vein, a little below the orifice, to hinder the blond from ascending. Keeping that position insert the tube upwards into the vein; when it is in, hold it and the skin close together between your finger and thumb. Then pull out of the tube the stopper, and insert the pipe, by which the arterial blood is to be infused from the emit-tent animal; managing the remainder according to the known method of this experiment.'*

**Page 203**
[*One of*] The experiments appointed for the next meeting were,
2. The blood of a dog to be passed out of the vena arteriosa into the aorta, without passing through the lungs, by Mr. Hooke.

**Page 204: 31 October 1667**
A report being made of Dr. Allen's scrupling to try the experiment of transfusion upon any of the mad people in Bethlem-hospital, it was ordered, that he should be desired by Mr. Hooke to give a meeting at Sir George Ent's house on the Monday following to some of the physicians of the Society, as Sir Theodore de Vaux, Dr. Clarke, Dr. Lower, Dr. Balle, and Dr. King, to consider together, how this experiment might be most conveniently and safely tried.

[*One of*] The experiments appointed for the next day were:
1. That of passing the blood of a dog from one side to the other, without its motion through the lungs.

**Page 207: 7 November 1667**
Mr. Hooke speaking again of his experiment of passing the blood of an animal out of one side to the other without its passing through the lungs, and showing his contrivance for performing it, was ordered to try it first in private; and lest there should fall too much air upon the blood, moving openly into the porringer from one side to the other, it was suggested, that a kind of cover should be prepared for the porringer to regulate the quantity of the air .

**Page 209: 4 November 1667**
Mr. Hooke related, that his experiment of making the blood of a dog pass from one side to the other, without passing through the lungs, had not succeeded in the way hitherto contrived by him; but that he had thought of another method, which he would farther consider of.

He was desired to give in writing all the particulars of the operation, and what hindered the success. *

** There are further requests made for a report on this experiment by Mr. Hooke at the meeting on 28 November 1667 (page 216) and 12 December 1667 (page 227) but it appears not to have been made and therefore it was presumably unsuccessful.*

**Page 214: 21 November 1667**

Dr. Lower having acquainted the Society, that one Arthur Coga [7] was willing to suffer the experiment of transfusion to be tried upon himself for a guinea, it was resolved, that the offer should be accepted, and the physicians of the Society be desired to be present at the operation to be performed on the Saturday following, the 23d instant about ten or eleven of the clock in the morning, at Arundel house; and that Dr. Lower and Dr. King particularly should be desired to manage the experiment; who were desired accordingly, and undertook the operation.

[7] Mr. Oldenburg in a letter to Mr. Boyle, dated at London Nov. 25. 1667, and printed in Mr. Boyle's works Vol. v. p. 371, 372, observes that this Mr. Coga was looked upon as *a very freakish and extravagant man*; that he had studied at Cambridge, and was said to be a bachelor of divinity and that he *was an indigent person*. And Dr. King in a letter to Mr. Boyle, dated the same day from Boswell court, London, (ibid. p. 638) remarks, that Mr. Coga was about thirty-two years of age; that he spoke Latin well, when he was in company, which he liked but that his *brain was sometimes a little too warm*.

*The transfusion of Arthur Coga is described in the Philosophical Transactions of the Royal Society, Vol. 2, Issue 30, pages 557-559, in the article titled 'An account of the experiment of transfusion, practiced upon a man in London', by Edmund King.*
*https://royalsocietypublishing.org/toc/rstl/1667/2/30*

*Dr. King gave his written account of the transfusion of sheep's blood into a vein of Mr. Coga at the meeting on 5 December 1667 (see page 222)*

*Arthur Coga gave a personal report of this transfusion to the Society on 28 November 1667 (see page 216).*

**Page 215**

Several anatomical experiments formerly ordered to be tried, not being ready, the trial of them was appointed for the next meeting; as 1. That of making the blood in a dog circulate between an artery and a vein on the same side, to see, how it would alter the circulation in the rest of the body; or what would become of the dog, if the blood could so quickly pass to the heart. 2. That of making the blood pass from one side of a dog to the other, without passing through the lungs.

**Page 216: 28 November 1667**

Mr. Coga, the first person in England, on whom the experiment of transfusion was made on the 23d instant, by order of the Society, and by the management of Dr. Lower and Dr. King [2], according to the method brought in by the latter, October 24, 1667, and entered in the register-book, presented himself before the Society, and produced a Latin paper of his own, giving an account of what he had observed in himself since he underwent the said experiment: which was ordered to be filed up, and Dr. Lower and Dr. King were desired to give in their accounts of the experiment.

It was ordered likewise, that Mr. Coga being willing to have the experiment repeated on him, it should be tried again accordingly, when the physicians of the Society should judge it seasonable.

[2] Mr. Oldenburg in his letter to Mr. Boyle of the 25th of November, cited in the preceding note, takes notice, that this experiment was performed at Arundel-house in the presence of many spectators, among whom were Mr. Henry Howard and both his sons, the bishop of Salisbury, four or five physicians, some parliament-men, &c. and that Dr. King performed the chief part of it with great dexterity, and so much ease to the patient, that he made not the least complaint, nor so much as any grimace, during the whole time of the operation that he found himself very well upon it, his pulse and appetite being better than before; his sleep good, his body as soluble as usual, it being observed, that the same day he had three or four stools, as he used to have before. On the morning of the date of Mr. Oldenburg's letter, the lord viscount Brouncker, who on account of very pressing business could not be present at the operation, and Mr. Oldenburg went to see Mr. Coga pretty early, and found him in bed, very well, as he assured them, and more composed, as his host affirmed, than before. Dr. King likewise in his letter written the same day, and cited above, remarks, that after the operation the patient was well and merry, and drank a glass or two of Canary *[*]*, and took a pipe of tobacco in the presence of forty or more persons; then went home, and continued well all day, having three or four stools, as he used to have, his pulse being stronger and fuller than before, and he very sober and quiet, more than before, as the people of the house said, who thought, that he had only been let blood. In the night he slept well, but sweat two or three hours, and next day was very well, and so remained, was very willing to have the experiment repeated, his arm being, he said, well. A person asking him, why he had not the blood of some other creature instead of that of a sheep transfused into him, he answered, Sanguis ovis symbolicam quandam facultatem habet cum sanguine Christi, quia Christus est agnus Dei.
*[Note: This broadly translates to: The blood of a sheep has symbolic power to the blood of Christ, because Christ is the Lamb of God.]*
** Canary was the word used to indicate a type of Spanish wine.*

Mr. Hooke being called upon for an account of the experiment which he undertook to try in private, of passing the blood of a dog from one side to the other without its passing through the lungs, said, that he had attempted it, but that it did not succeed so well as he wished; but that he thought he had now devised a method of making it succeed as he desired, of which he hoped to give the Society a good account at the next meeting.

**Page 222: 5 December 1667**
Dr. King brought in his written account of the transfusion of sheep's blood into a vein of Mr. Coga, which was ordered to be registered [h].

[h] Register, Vol. iii, p. 233. It is printed in the Philos. Transact. Vol. ii, Nº 30, p. 557 for December 1667.
https://royalsocietypublishing.org/toc/rstl/1667/2/30

*Note: It is possible, given the various comments regarding Mr. Arthur Coga's 'attitude' that the transfusion was performed on him to see if it changed his character. This is actually stated as being the case by Maluf (1954) but is not identified directly in the published accounts of the transfusion.*

**Page 223**
Mr. Oldenburg produced likewise a great packet of letters and other papers sent to him by Mr. Hevelius from Danzig and several other places on the Baltic, … To which were added several relations of other particulars communicated by some learned men at Danzig and other places adjacent, of their own accord, concerning trials made of injecting liquors into human veins, … Of these papers only that on the trials of injection [n] was read at this meeting, and the rest referred to the next.

[n] This paper, which does not appear in the register-books, contained, according to Mr. Oldenburg in a letter to Mr. Boyle of December 10, 1667 (Mr. Boyle's works, vol. v. p. 375) an account of three persons, upon whom injection into the veins had been tried, of whom two received great benefit, but the third died, though through his own neglect. Upon hearing this account read, a certain physician then present, a learned and ingenious man, "was to my great grief, says Mr. Oldenburg, so precipitate, as to say, That he would engage, that that one, viz. with the ill success, was the only true, but the other two both false. I could not but take him afterwards aside, and represent to him, how he would resent it, if he should communicate upon his own knowledge an unusual experiment to the curious at Danzig, and they in public brand it with the mark of falsehood: that such expressions in so public a place and in so mixed an assembly would certainly prove very destructive to all philosophical commerce, if the curious abroad should be once informed, how their symbolas were received at the Royal Society."

*The research work quoted by Henry Oldenburg is in fact that performed by Dr. Fabricius, which was published in the 9 December 1667 edition of the Philosophical Transactions of the Royal Society, Vol. 2, Issue 30, p. 564-565.*
*https://royalsocietypublishing.org/toc/rstl/1667/2/30*

*Additional information regarding the infusion experiments performed in Danzig is presented as an extract of a letter, dated 18 August 1668, sent to Robert Boyle, published in the 21 September 1668 edition of the Philosophical Transactions of the Royal Society, Vol. 3, Issue 39, p. 766-767.*
*https://royalsocietypublishing.org/toc/rstl/1668/3/39*

**Page 224**
It was ordered, that the experiment of transfusion be made at the next meeting, and that Dr. Lower and Dr. King be desired to manage it, as they did before; and that the operator do not fail to prepare things necessary for that purpose, especially good scales to weigh the emittent animal in both before and after the operation.

**Page 225: 12 December 1667**
The second experiment of transfusion was made by Dr. King upon Mr. Arthur Coga, by taking from him eight ounces of blood, and transmitting into him, by guess, about fourteen ounces of sheep's blood. Dr. King was desired to bring in an account of it to be registered. * This experiment being made in a great crowd of spectators, which would not admit of that exactness, which was designed, the physicians of the Society were requested to take an opportunity of making this experiment more exactly by weighing the emittent animal before and after transfusion.

** This account was presented at the meeting on 9 January 1668 (see page 236)*

*Arthur Coga gave a personal report of this transfusion to the Society on 19 December 1667 (see page 227). This second transfusion of Mr. Arthur Coga was not recorded in the Philosophical Transactions of the Royal Society.*

**Page 227**
Mr. Hooke was called upon for the experiment of circulating the blood of an animal out of the veins into the arteries through an open vessel, without passing through the lungs. He said, that he would prepare it as soon as he could.

**Page 227: 19 December 1667**
Mr. Coga being introduced gave an account of the effects of the experiment of transfusion repeated upon him, viz. that he found himself very well at present, though

he had been at first somewhat feverish upon it; which was imputed to his excess in drinking too much wine soon after the operation. An account there of in writing was desired to be brought in by the managers of that second experiment.

For the prosecution of experiments of that kind, Dr. Croune was desired to speak with Dr. Terne, physician to one of the hospitals in London, that he would try the experiment, as he had opportunity, upon such patients there, as he and others of the physicians of the Society should think proper subjects for it.

Dr. Willis suggested, that this experiment might be proper to make use of upon rotten sheep.

**Page 235: 2 January 1668**
Dr. Croune reported, that Dr. Terne was willing, at the desire of the Society, to try the experiment of transfusion upon morbid persons, as he should see opportunity, in the hospital, to which he was physician.

**Page 236: 9 January 1668**
Dr. King communicated his written account of the experiment of transfusion, as it was the second time made on Mr. Coga; which was ordered to be registered [a].

[a] Register, Vol. iii, p. 280.

*This second transfusion of Mr. Arthur Coga, performed on the 12 December 1667, was not recorded in the Philosophical Transactions of the Royal Society.*

**Page 246: 6 February 1668**
Mr. Oldenburg communicated and read a printed letter sent to him by the author John [*sic*] Denis, M.D. professor of philosophy and mathematics at Paris, relating to a late cure of an inveterate phrensy by the transfusion of blood [n].

[n] An extract of it is printed in the Philos. Transact. N° 32, p. 617.
*https://royalsocietypublishing.org/toc/rstl/1668/2/32*

**Page 250: 20 February 1668**
Dr. Clarke mentioned, that there was a poor distracted woman, who seemed to him a fit subject to try the transfusion upon; but that the not being provided for, it was to be feared, that she would lie upon the Society's hands, after the experiment should be made upon her. He was therefore desired to speak with some of the officers of the parish, where she was then maintained, that in case they would continue to provide for her, the transfusion should be made upon her, as a means, which the physicians thought not unlikely to cure her.

**Page 312: 6 August 1668**
Mr. Oldenburg related, that at Vienna in Germany, the experiment of transfusion had been made on several dogs with good success; and that amongst the rest an old dog scarce able to go about for age, had been by the transfusion of blood from a vigorous one restored to great vigour: and that it was resolved there to prosecute the experiment, and to try it on men.

*The source and detail of this information reported by Henry Oldenburg is not identified. There is in addition no indication that this communication was recorded in the Letter-Book. Note: Paul Scheel in his 1802 book 'Die transfusion des blutes und einspreutzung der arzeneyen in die adern' does not quote any transfusion experiments performed on dogs in Vienna in 1668.*

**Page 316: 29 October 1668**

The bishop of Chester related to the Society two experiments, * which he had lately seen made at Exeter by Dr. Thruston: one was of transfusion, in which they had caused a dog to be first weighed before the operation, and found his weight to be fifteen pounds and three ounces. Afterwards he was shut up tied for two or three hours, during which time he had spent in effluvia and otherwise about three ounces, as they found by weighing him again: then they let a sheep bleed into him so liberally, that the dog being weighed again after that transfusion was found to weigh seventeen pounds; whereupon he fell into a great disorder and agony, and died. Being opened, his heart was found full of coagulated blood, and the stomach black and bloody, and all his veins exceedingly distended; which could not but stop the free motion of the blood, and suffocate the animal.

* *Note: The second experiment mentioned above was not related to transfusion*.

**Page 339: 14 January 1669**

Mr. Oldenburg communicated and read three letters from foreign parts: [*the second of these is related to transfusion**] - 2. Of Dr. Fabricius, a physician of Dantzick, written to Dr. Timothy Clarke, and dated October 20, 1668, relating several considerable and successful experiments made by injecting liquors into veins, and curing divers [*sic*] diseases, as the gout, the plica Polonica [*sic*], ulcers and tumours, madness, &c.

It was ordered, that Dr. Clarke be desired to hasten the publication of his book of the various experiments of injection. **

Dr. Croune having moved, that the experiment so often mentioned of feeding a dog by blood alone, injected into him by a vein every day, might be made, it was ordered, that the physicians of the Society should be desired to take care of this experiment; and the operator was ordered to attend them for that purpose: as also, that the same persons should be desired to consider of the fitness of prosecuting the experiment of transfusion; and having agreed what patients it is most proper to be tried upon, to suggest to the governors of hospitals to give leave for that practice.

** This letter is referred to in the next meeting on 21 January 1669 (see page 341).*
** *Note: Dr. Clarke died in 1672 without completing his publication*.

**Page 341: 21 January 1669**

Dr. Timothy Clarke communicated a letter to him from Mr. Michael Behm, consul at Dantzick, dated there November 2, 1668, containing diverse considerable particulars relating to the injection of liquors into veins, degeneration of blood, [*and other non-transfusion matters*]. It was read, and ordered to be entered into the Letter-Book [h], Dr. Clarke having given permission for it, who was desired to continue his correspondence with that intelligent person, as well as with Dr. Fabricius, whose letter had been read at the preceding meeting,

[h] Supplement, Vol. ii , p. 920.

Notice being taken, that in foreign parts the experiments of injection and transfusion were much practised and improved, whereas they were neglected in England, where they were first invented; it was thought proper, that the cases, mentioned in Dr. Fabricius's letter, wherein they had succeeded, should be published in the Philosophical Transactions, and the physicians of the Society desired, that if they were satisfied therein, they would declare their approbation of the fitness of the trying such experiments in the like cases here: which being done, that it should be represented and recommended to the governors of the hospitals in London for obtaining their leave of making use thereof, in such cases.

*Note: Dr. Fabricius's letter was not published in the Philosophical Transactions of the Royal Society.*

**Page 353: 4 March 1669**

Three books were presented to the Society: [*one of these three is*]: *Tractatus de Corde: item de motu & calore sanguinis, et chyli in eum transitu*, by Richard Lower, M.D. [u].

[u] Printed at London 1669 in 8vo. Mr. Oldenburg in his account of this book in the *Philos. Transat*. Vol. iv, N° 45, p. 911, takes notice of a mistake in it, chap. iv. where Dr. Lower calls those *Transactions* the *Transactions of the Society*; "which certainly he would not have done, says Mr. Oldenburg, if he had either but taken notice of what is said in Nº 11. of the same, or else considered, that so illustrious, and learned a body would certainly, if they thought fit to publish anything, entertain the knowing world both with sublimer [*sic*] matter and with a suitable eloquence."
https://royalsocietypublishing.org/toc/rstl/1669/4/45

**Page 356: 18 March 1669**

Dr. Croune proposed an experiment, to try, whether an animal would be fed by blood alone transfused into it, viz by inclosing two dogs in a box, and making the blood circulate from the one to the other by way of transfusion, feeding the one and not the other.

He was desired to make the experiment, and Dr. Allen and Mr. Hooke to assist him in it.

**Page 361: 29 April 1669**

Mr. Aubrey produced a letter written to him by Mr. Francis Potter in 1652, signifying, that at that time the writer of it had made some trials of the transfusion of blood.

*There is no indication given that this letter was recorded in the Letter-Book.*
*Note: Details regarding Francis Potter's experiments are discussed by Webster (1971). It is interesting that this letter was produced by Mr. Aubrey at this time and not earlier, especially since Francis Potter was elected a Fellow of the Royal Society in 1663. In addition, it seems surprising that this information was not used by Oldenburg in the 'English-French transfusion priority argument', though this could possibly be due to the decreasing interest in blood transfusion that resulted from the court ruling in Paris following the death of Antoine Mouroy.*

**Page 362: 6 May 1669**
Dr. Croune being put in mind of the experiment of making a circular transfusion of blood in two dogs, said, that something was already done in order to it, and that he would go about it as soon as he could.

He mentioned, that from this experiment it would appear, whether blood nourishes, or not; and added, that this experiment might be carried on, to find, whether one animal might be kept alive without breaching, by the breathing of the other only.

**Page 377: 3 June 1669**
Dr. Croune being called upon concerning the experiments of transfusion and those of motion, said, that he had wanted hitherto the hands of the operator, who was therefore ordered anew to defer no longer the furnishing of all the necessaries for those experiments, nor his attendance at such times, as should be convenient for Dr. Croune.

*NOTE: This is the last entry related to transfusion contained within Volume II – the last meeting entry of this volume being 21 December 1671*

## VOLUME III

*NOTE: The first meeting in this volume is dated 11 January 1672 and the last 18 December 1679. There is no entry relating to infusion / injection or blood transfusion in this volume.*

## VOLUME IV

*NOTE: The first meeting in this volume is dated 8 January 1680 and the last 14 December 1687. There is no entry relating to blood transfusion in this volume and only one relating to injection / infusion, which is included in a letter together with other pieces of information:*

**Page 482: 12 May 1686**
A letter of Mr. St. George Ash, dated at Trinity-College, Dublin, April 27, 1686 [p], was read, giving an account of his method of demonstrating the 2nd and 5th books of Euclid; of a dog, that was immediately killed by injecting into the jugular vein an infusion of opium in brandy and water; of the mathematical girl at Dublin; as likewise of the opinion of the Dublin Society concerning Mr. Hooke's level.

[p] Letter-book, Vol. x, p. 309