Claims

1. An extracorporeal blood treatment system (50) for treating a subject suffering from cancer, the system comprising:
an extracorporeal blood circuit (52a, 52b);
a dialysate fluid circuit (54a, 54b);
said extracorporeal blood circuit (52a, 52b) and dialysate fluid circuit (54a, 54b) being divided by a membrane (59) of a filtration unit (58);
at least one blood pump (60) for controlling the flow of blood through the extracorporeal blood circuit (52a, 52b);
at least one dialysate fluid pump (62, 68) for controlling the flow of dialysate fluid through the dialysate fluid circuit (54a, 54b);
optionally one or more infusion lines (66, 80, 81, 82), each infusion line being connected to the extracorporeal blood circuit (52a, 52b) or adapted for being directly connected to the vascular system of the subject to be treated, each infusion line comprising an infusion pump;
a system computing unit (64) operatively connected to the at least one blood pump (60) and the at least one dialysate fluid pump (62, 68) and optionally to the one or more infusion pumps of the one or more infusion lines (66, 80,81, 82), said system computing unit having a user interface including an input means and a display means; wherein
the system computing unit (64) is adapted for receiving a desired blood concentration value GLN_b of glutamine (901) within the range of 0.1 and 0.5 mM;
the system computing unit (64) is adapted for receiving a desired blood concentration value $GLUCOSE_b$ of glucose (903) within the range of 2 to 4 mM;
the system computing unit (64) is adapted for receiving a desired blood concentration value $KETONE_b$ of a ketone body, such as acetoacetate, beta-hydroxybutyrate or pharmaceutically acceptable derivatives, esters and salts thereof (905) within the range of 1 – 15 mM;
the system computing unit (64) is adapted for receiving a concentration value GLN_p representing the concentration of glutamine or pharmaceutically acceptable glutamine-containing compounds in fresh dialysate fluid (902);
the system computing unit (64) is adapted for receiving a concentration value $GLUCOSE_p$ representing the concentration of glucose in fresh dialysate fluid (904);
optionally, the system computing unit (64) is adapted for receiving a concentration value $KETONE_p$,,representing the concentration of a ketone body, such as acetoacetate, beta-hydroxybutyrate or pharmaceutically acceptable derivatives, esters and salts thereof in fresh dialysate fluid (907);

optionally, the system computing unit (64) is adapted for receiving a concentration value $KETONE_i$ representing the concentration of a ketone body such as acetoacetate, beta-hydroxybutyrate or pharmaceutically acceptable derivatives, esters and salts thereof in an infusion liquid to be infused into the extracorporeal blood line (52b) or directly into the vascular system of said subject to be treated, through one of said one or more infusion lines (66, 80, 81, 82) (906);

the system computing unit (64) is adapted for receiving an actual concentration value GLN_a of glutamine in blood from said treated subject (909) and receiving an actual concentration value $GLUCOSE_a$ of glucose in blood from said treated subject (910) and receiving an actual concentration value $KETONE_a$ of a ketone body such as acetoacetate and/or beta-hydroxybutyrate (911);

the system computing unit (64) being adapted for controlling said blood pump (60) and said dialysate fluid pump (62, 68) in such a way that the actual blood concentration value GLN_a of glutamine is driven towards or below GLN_b (912) and the actual blood concentration value $GLUCOSE_a$ of glucose is driven towards or below $GLUCOSE_b$ (914);

and

if the system (50) comprises one or more of said infusion lines (66, 80, 81, 82) and in case one of said infusion lines (66, 80, 81, 82) is adapted for infusing said infusion liquid into the extracorporeal blood line (52b) or directly into the vascular system of said subject to be treated, the system computing unit (64) is adapted for controlling said infusion pump of said infusion line in such a way that the actual blood concentration value $KETONE_a$ is driven towards $KETONE_b$ (920); or alternatively

if the system (50) does not comprise such an infusion line (66, 80, 81, 82), the system computing unit (64) is adapted for comparing $KETONE_a$ and $KETONE_b$, and if $KETONE_a < KETONE_b$, displaying a message on said display informing that the treated subject should consume a further amount of ketone bodies or medium chain triglycerides.

2. An extracorporeal blood treatment system (50) according to claim 1, wherein

the system (50) comprises one or more of said infusion lines (66, 80, 81, 82), and

the system computing unit (64) is adapted for receiving a concentration value $KETONE_i$ representing the concentration of a ketone body such as acetoacetate, beta-hydroxybutyrate or pharmaceutically acceptable derivatives, esters and salts thereof in an infusion liquid to be infused into the extracorporeal blood line (52b) or directly into

the vascular system of the subject to be treated, through one of said one or more infusion lines (66, 80, 81, 82) (906), and

the system computing unit (64) is adapted for controlling said infusion pump of said infusion line in such a way that the actual blood concentration value $KETONE_a$ is driven towards $KETONE_b$ (920).

3. An extracorporeal blood treatment system (50) according to claim 2, wherein the system computing unit (64) is adapted for monitoring GLN_a and initiating infusion of a composition containing glutamine or pharmaceutically acceptable glutamine-containing compounds if GLN_a is lower than GLN_b (916) by starting a relevant infusion pump in one of the one or more infusion lines (66, 80, 81, 82), and maintaining said infusion until GLN_a is equal to GLN_b.

4. An extracorporeal blood treatment system (50) according to any one of claims 2 to 3, wherein the system computing unit (64) is adapted for monitoring $GLUCOSE_a$, and initiating infusion of a composition containing glucose if $GLUCOSE_a$ is lower than $GLUCOSE_b$ (918) by starting a relevant infusion pump in one of the one or more infusion lines (66, 80, 81, 82), and maintaining said infusion until $GLUCOSE_a$ is equal to $GLUCOSE_b$ (918).

5. An extracorporeal blood treatment system according to any preceding claim wherein a filtration membrane has a molecular weight cut off (MWCO) of less than 60kDa.

6. An extracorporeal blood treatment system according to claim 5 wherein the filtration membrane has a MWCO of less than about 50kDa or less than about 40 kDa (such as less than 30 kDa, less than 10 kDa, less than 5 kDa or less than 2 kDa).

7. An extracorporeal blood treatment system according to any preceding claim wherein the blood circuit comprises a thermal management system for heating or cooling blood in the blood line during use.

8. An extracorporeal blood treatment system according to claim 7 wherein the thermal management system is controllable to regulate the temperature of blood in the blood circuit to a temperature between 20°C and 43°C.

9. An extracorporeal blood treatment system according to any preceding claim, further comprising on or more sensors (S, 90, 91, 92, 93) for the detection of analytes selected

from the group glucose, glutamine, and ketone bodies, the sensor(s) (S, 90, 91, 92, 93) being preferably positioned in an effluent portion (54a) of the dialysate fluid circuit, the sensors being in communication with the system processing unit (64) and providing an output indicative of the concentration of the analyte(s) in blood or preferably in spent dialysate fluid; wherein the system processing unit (64) is configured to determine from the output(s) of the sensor(s) (S, 90, 91, 92, 93) a representative blood concentration of the analyte(s), thereby monitoring at least one of GLN_a, $GLUCOSE_a$ and $KETONE_a$.

10. A therapy set for use in an extracorporeal blood treatment system (50) according to any of claims 1 - 9, the set comprising
a filtration unit (58) having a membrane (59) which divides an integrated blood line (52a, 52b) and an integrated dialysate fluid line (54a, 54b), wherein the blood line (52a, 52b) and/or the dialysate fluid line (54a, 54b) comprises sensors (S, 90, 91, 92, 93) for monitoring at least one of GLN_a, $GLUCOSE_a$, and $KETONE_a$.

11. A system computing unit (64) adapted for controlling an extracorporeal blood treatment system (50) for treating a subject suffering from cancer; said system computing unit comprising:
a plurality of output means adapted for being operatively connected to at least one blood pump (60), at least one dialysate fluid pump (62, 68) and optionally one or more infusion pumps for controlling the flow in each of one or more infusion lines (66, 80, 81, 82);
a user interface including an input means, and a display means; and
a memory means and a calculation means;
the system computing unit (64) being adapted for receiving a desired blood concentration value GLN_b of glutamine (901);
the system computing unit (64) being adapted for receiving a desired blood concentration value $GLUCOSE_b$ of glucose (903);
the system computing unit (64) being adapted for receiving a desired blood concentration value $KETONE_b$ of a ketone body (905)
the system computing unit (64) being adapted for receiving a dialysate concentration value GLN_p of glutamine (902);
the system computing unit (64) being adapted for receiving a dialysate concentration value $GLUCOSE_p$ of glucose (904);
optionally, the system computing unit (64) being adapted for receiving a concentration value $KETONE_p$,,representing the concentration of a ketone body, such as

acetoacetate, beta-hydroxybutyrate or pharmaceutically acceptable derivatives, esters and salts thereof in fresh dialysate fluid (907);

optionally, the system computing unit (64) being adapted for receiving an infusion liquid concentration value $KETONE_i$ of a ketone body (906);
the system computing unit (64) being adapted for receiving an actual blood concentration value GLN_a of glutamine (909);
the system computing unit (64) being adapted for receiving an actual blood concentration value $GLUCOSE_a$ of glucose (910);
the system computing unit (64) being adapted for receiving an actual blood concentration value $KETONE_a$ of a ketone body such as beta-hydroxybutyrate and/or acetoacetate (911);
the system computing unit (64) being adapted for controlling said blood pump (60) and said dialysate fluid pump (62, 68) in such a way that the actual blood concentration value GLN_a of glutamine is driven towards or below GLN_b (912), and the actual blood concentration value $GLUCOSE_a$ of glucose is driven towards or below $Glucose_b$ (914);
and
in case an infusion pump is operatively connected to the system computing unit (64), the system computing unit (64) is adapted for controlling the infusion pump in such a way that the actual blood concentration value $KETONE_a$ is driven towards $KETONE_b$ (920);
and
in case no infusion pump is operatively connected to the system computing unit (64), the system computing unit (64) is adapted for comparing $KETONE_a$ and $KETONE_b$, and if $KETONE_a < KETONE_b$, displaying a message on said display informing that the treated subject should consume a further amount of ketone bodies or medium chain triglycerides.